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The Institution of Electrical Engineers.

AS long ago as 1879 there was "a feeling of dissatisfaction among many members of the Society of Telegraph Engineers," who held the opinion that the Society did not "meet the wants of the whole electrical profession"; that it was "too technical in its character, and too restricted in the scope of its deliberations." Thus read the leading article of the TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW of April 15th, 1879, supporting a letter to similar effect, addressed by Mr. Latimer Clark to the President and Council. From time to time since then the scope of the policy of the Institution of Electrical Engineers has come under keen scrutiny; the classic presidential address in the year 1910 of Dr. S. Z. de Ferranti, foreshadowing so many developments which even now are only in course of evolution, but are confidently looked forward to, opened a new era, and his successor, the late Mr. W. Duddell, in his address in 1912, remarked that the Institution, in its new home, was now prepared "to undertake its proper functions with regard to the electrical industry," on the one hand, "in encouraging the publication of scientific technical knowledge, and on the other, in looking after the interests of the electrical industry." In the light of that comment we then looked forward "to the accomplishment of solid progress in the direction of broadening the scope of the Institution's operations, and extending the benefits of membership." (ELEC. REV., November 22nd, 1912, p. 818.)

Then, and on other occasions, we urged the Council of the Institution to continue along the path of the "Broader Policy" thus outlined; but there is always a tendency to backsliding, and the tide set once more towards stiffness and starchiness, reaching the high-water mark in the spring of 1914, when the Council precipitately dissolved the Industrial Committee, "one of the first-fruits of the Broader Policy which took its rise under the Ferranti *régime*." We deplored that reactionary step, holding that the Council would commit a grave error if it preferred tradition to fact. It was left for the late Mr. C. H. Wordingham (though he supported the Council on that occasion) to infuse new vigour into the Institution by his boundless energy and self-sacrifice in 1917 and 1918, it was in his day that the "informal meetings" and other valuable new features

of the life of the Institution came into existence, and since that time the membership roll has rapidly extended. But still the Institution does not do enough for its members—many of them, at any rate. Periodically they are told that their question should be: "What can I do for the Institution?"—not: "What does the Institution do for me?" That is a sound maxim; but it is not sufficient in itself. People want the butter and jam of reciprocal benefit with their dry bread of service, and a wise Council will see that they get it.

With this preamble we give a hearty welcome to the presidential address of Lieut.-Col K. Edgcumbe, delivered on Thursday, last week, which frankly states that "it is now generally agreed that the Institution cannot confine itself to the rigidly technical aspects of electrical engineering, to the exclusion of economic and industrial considerations." That is the view which we have always held, and have repeatedly voiced in these columns, at times incurring the wrath of the Council for our temerity. Judging by the reception accorded to Col. Edgcumbe's departure from precedent, in the delivery of a presidential address on the economic and industrial aspects of the electrical industry, his action has the cordial approval of the members; and his sportsmanlike challenge to free and frank discussion of the subject of the address at the well-attended "informal meeting" on Monday evening was rewarded by an extremely interesting and lively debate, in which it was viewed from as many different aspects as there were speakers; whilst opposition to the president's opinions was not wanting, they found plenty of support, and the opportunity to ventilate such questions was clearly appreciated.

We have not space here to comment upon the address in detail; with much of it we cordially agree, and we must congratulate the author upon the originality and ability with which he marshalled his facts and drew conclusions from them. Especially we welcome his treatment of the question of unemployment, which is so grave a feature of our national economy to-day. That the right solution to this problem is not the reduction of wages, but the increase of output per unit wage, most readers will agree; we have supported that policy not only since but before the war—the difficulty is to carry it into effect. Col. Edgcumbe advances the view that if, say, half the manufactured goods imported into this country were made at home, the market necessary for the absorption of the increased output would thus be provided; and the policy which we have consistently supported for more years than we care to remember—namely, "buy British goods!"—is in full accord with that suggestion. The president regards the curtailment of imports as an economic necessity.

So far as the electrical industry is concerned, Col. Edgcumbe, like the rest of us (*pace* the recent report of the Statistical Department of the B.E.A.M.A.), is an optimist; he looks for an increased output of electrical energy for industrial purposes of over 100 per cent. in the next decade, and that, of course, implies a corresponding degree of progress and prosperity for all branches of electrical industry. Moreover, the domestic load is increasing more rapidly than the power load, and is capable of still greater development. On the whole, we see no reason for repining; and we are grateful to the president for a thoughtful and stimulating address, which ought to be studied by all who are concerned with or for the future of the electrical profession and industry.

What is a Billion?

Judging from our experience at the recent Fuel Conference of the World Power Conference held in London, it would appear desirable that the Organising Committee should decide on a definite international meaning of the word "billion." In many of the papers submitted at the Conference meetings the word was used, and later it was discovered that a different value was given to it, according to the nationality of the author of the paper, or the participant in the discussion. As examples it may be mentioned that, whereas in this country a billion is regarded as being a million millions, by some of the American visitors it was used to represent a thousand millions. There is, of course, a big difference between the two values, and in order to prevent any misunderstanding we suggest that the World Power Conference officials at future gatherings should make it clear what is internationally to be regarded as the meaning of the word "billion."

Portable Tool Developments.

Portable tools become more popular all the time and, should a real revival of shipbuilding and heavy engineering take place, firms specialising in the manufacture of portable electric tools would experience an unprecedented demand. Observation of the performance of some of the latest types of these tools creates a favourable impression with regard to their efficiency. A portable electric sander is driven by a motor which operates on either direct curent, or alternating current of from 25 to 60 cycles; this is an important feature, particularly in the case of contractors who may carry the tool from one job to another where the supply conditions are different. The sanding pad is driven through a train of high-grade steel gears. It cannot be urged that pneumatic tools are more trouble-free than electric tools, because, in tools such as that above-mentioned, there are few moving parts, and they are made so heavy and strong that the usual troubles are eliminated. The electric grinder is well known, and also the small saw table on which wood or metal can be sawn. Electric valve refacers are now in almost general use in well-equipped garages, and also electric drills, but a portable tool that is not sufficiently well known is the electric tapper. Tapping by hand is not only slow, but also requires considerable skill. With the electric tapper, threads can be cut in steel, cast iron, brass, or aluminium at a much greater speed than is possible by hand. A three-jaw geared tap chuck automatically reverses and backs the tap out of the threaded hole at double speed when the operator gives a backward pull on the machine, and no reversing switch is needed. Even in repetition factories there is abundant scope for electric portable tools.

The Centenary of Sir Joseph Swan.

As we briefly mentioned in our last issue, Wednesday, October 31st, was the hundreth anniversary of the birth of Sir Joseph Wilson Swan, D.Sc., F.R.S. —a man who was not only honoured by the whole world for his many inventions, but was beloved of all for his personal charm. Whilst his work covered a wide field in the realms of chemistry and photography, he is best known to the electrical world as the inventor of the first successful carbon-filament incandescent electric lamp. His experiments began in 1845, with the object of devising a lamp with a carbon filament *in vacuo*, and by 1855 he had produced strong carbon spirals; in 1860 he showed his friends a lamp with a carbon filament. The invention of the Sprengel air pump in 1865, and the development of the dynamo a few years later, led to further progress, and in December, 1878, he exhibited his lamp in public, at Newcastle. Unfortunately he did not patent it until January, 1880. An account of the circumstances was given in the Electrical Review of May 9th, 1924, pp. 742-3, and of Swan's career in our issue of November 24th, 1904.

In the meantime, T. A. Edison, in the United States, was working towards the same goal, with platino-iridium filaments (Elec. Rev., December 15th, 1878, p. 496); but these proved a failure, though he was still using metal filaments up to the middle of 1879. The first account of his carbon-filament lamp, patented in 1879, appeared in our pages on January 15th, 1880, p. 28; but even then he was using cardboard and had not arrived at the bamboo fibre, whilst Swan was already using parchmentised thread.

The Maentwrog Hydro-electric Scheme.

Descriptive details of recent developments of the North Wales Power Co., Ltd., with particular reference to its new water-power plant in the Afon Prysor Valley, with an initial capacity of 22,500 kVA.

(*Concluded from page* 702.)

As was briefly stated last week, the whole of the power-house switchgear is of the 3-phase Reyrolle metal-clad draw-out type. The main

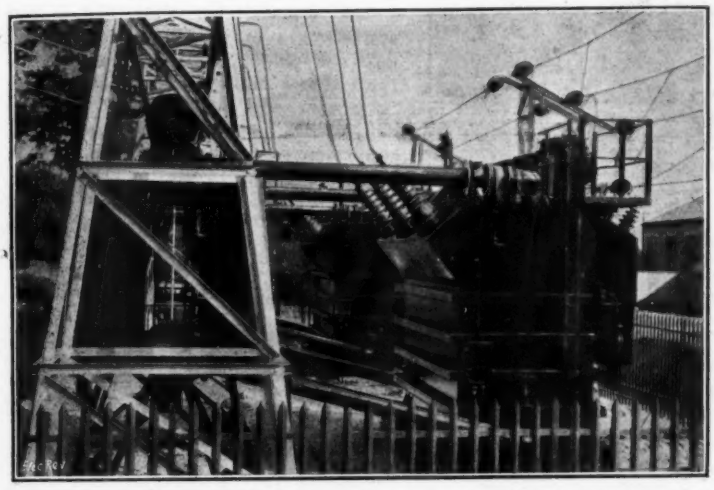


Fig. 13.—Legacy Sub-station Transformers, with Separate Oil Coolers.

10-panel, 6,600-volt bank (fig. 7 last week) consists of three oil-immersed circuit breakers of the horizontal draw-out type for controlling the three alternators, two for the two 10,000-kVA banks of transformers stepping up to the 66-kV transmission lines, two for the two 3,500-kVA banks of transformers stepping up to 35 kV, one for the transformer supplying the power station auxiliaries and for lighting, one for an outgoing high-voltage feeder, and one for service as a bus-bar coupler. The breakers on this board have a breaking capacity of 350,000 kVA, and the panels are of the duplicate bus-bar type. Merz-Price circulating-current protection is provided for the generators and works transformer, and plain overload protection on the outgoing feeder circuits.

The 5-panel, 35-kV switchboard is also of the duplicate bus-bar type and consists of two three-phase circuit breakers for controlling the two 3,500-kVA transformer banks previously referred to and three circuit breakers for the outgoing transmission lines to Llanfrothen, Dolgarrog, and Oakeley sub-stations, respectively. The circuit breakers on this board have a breaking capacity of 500,000 kVA. The circuit-breakers are electrically operated by means of solenoids energised from a separate control board (fig. 8 last week) of desk-type cubicles of sheet-steel construction, with dust-

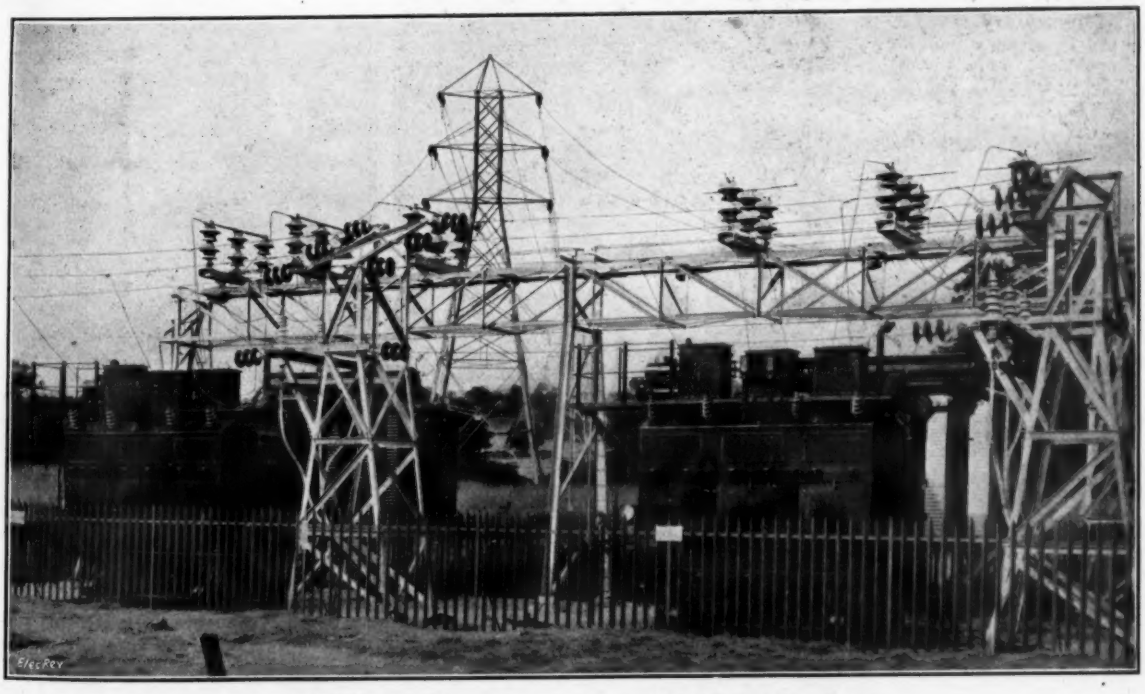


Fig. 14.—Legacy Line Terminal Frame and 66/33-kV Transformers.

tight doors at the back and lift-up desk lids at the front. Each cubicle is surmounted with a mimic diagram of the circuit, with automatic disks and lamps for the visual indication of the positions of the circuit breakers; indication is also given in a similar manner when any of the feeder lines are earthed.

A neutral earthing resistance is provided for the three alternators and also another resistance for the

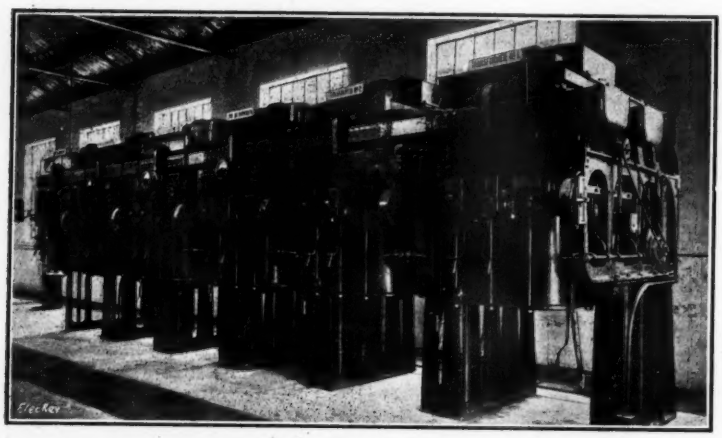


Fig. 15.—Metal-clad 33-kV Switchgear in Legacy Sub-station.

3,500-kVA transformers. In each case they are coupled to the neutrals through single-phase draw-out solenoid-operated metal-clad Reyrolle circuit breakers, mounted in the basement and operated from the main board.

The transformers which step up the generated voltage to feeder pressure are located in a special compound adjoining the station building. There are two 3,500-kVA three-phase, 6,600/20,000/35,000-volt units (Ferranti) for use on the interconnectors to Dolgarrog and Cwm Dyli generating stations and the western area feeders. Six "English Electric" single-phase transformers (fig. 9, p. 701, erroneously described as "Ferranti" in our last issue) in two banks of 10,000-kVA capacity with 6,600/66,000-volt ratio are provided to transmit the bulk of the power from Maentwrog to the Wrexham and Crewe areas. They are of the outdoor type, oil-immersed and self-cooled, an interesting feature of the three-phase units being the special cable boxes which permit removal of the transformers without the cable joints being disturbed. The foundations have been so designed that any transformer can be readily brought under the power-house crane by means of a special truck running on standard-gauge track laid between the transformer compound and the loading bay. All transformers are controlled from the 6.6-kV switchboard to which they are coupled by single-core cables. The 35-kV sides of the three-phase units are coupled by single-core cables to the 35-kV switchboard, which is connected to the 35-kV transmission lines by means of three-core cables of the belted type. The e.h.p. sides of the 10,000-kVA banks are directly coupled to the feeder ends, there being no 66-kV switchgear.

The power-house crane was supplied by S. H. Heywood & Co., Ltd., the cables by the Pirelli General Cable Works, Ltd., and the lighting installation was carried out by the West Wales Electric Co., Ltd.

The transmission and distribution systems are entirely overhead, carried on wood poles and lattice steel towers, the voltages employed being 66, 35, 33, 20, 10, 11, and 6.6 kV; with the exception of the new line mentioned below, copper conductors are used, 19/.083 in. strand of 0.1 sq. in. section. The 66-kV double 3-phase circuit transmission line (figs. 10 and 11 last week) between the Maentwrog water-power station and the Legacy sub-station, 45 miles long, is of galvanised lattice-steel tower construction (Siemens Bros. & Co., Ltd.), with normal spans of 650 ft., special towers being used for road crossings and at angle and section points. The insulators are of the suspension pattern, each string consisting of four sheds in series on straight-line towers and of five sheds in series at road crossings and other points requiring special provision. The conductors consist of a steel core of 7/.0785 in. diameter surrounded by 26/.10 in. diameter aluminium strands; that is, of 0.125 sq. in. equivalent copper. A galvanised-steel earth conductor is attached to the tops of the towers.

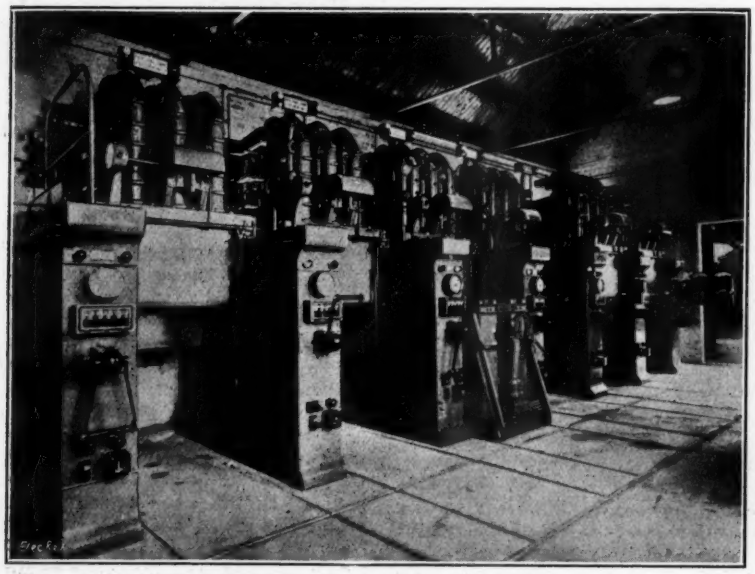


Fig. 16.—Crewe Sub-station 33-kV Switchgear.

Fig. 17.—Outdoor Switch-fuse.

To facilitate maintenance, an outdoor switching station has been erected midway, near Corwen, to provide complete control by cross connection of the double 66-kV circuits in either direction. The steel towers (fig. 12 last week) were supplied by Siemens Bros. & Co., Ltd., and the air-break switchgear by the Metropolitan-Vickers Electrical Co., Ltd. Provision has been made for a future tap to be taken off for the installation

of a local transformer for an intermediate pressure. The Legacy sub-station near Wrexham is the eastern transmission centre of the North Wales Power Co.'s system, and six main lines converge to it: namely, two 66-kV lines from the Maentwrog water-power station, two 33-kV lines from the Crewe sub-station, and two 33-kV lines from the Dolgarrog hydro-electric station, *via* the coast route. Graded-relay (Metropolitan-Vickers Electrical Co., Ltd.) protection is provided for the lines. At the Maentwrog end of the 66-kV line "PB"-type overload and leakage relays are used, and also special low-energy type "PB" relays operated from bushing transformers in the neutral connection of the 33-kV system. Both the single- and 3-pole induction relays used at this point are of the inverse time over-current pattern with an adjustable definite-minimum time element. At the other end of the line at Wrexham directional protection is provided by "NP" reverse-current relays with an adjustable definite-minimum inverse time limit. In addition, the whole of the Company's 33-kV system round the coast is protected also with "PB" and "NP" relays.

of Messrs. Foden, Ltd., at Sandbach, in addition to the towns and villages to the east of Crewe.

The main 6-panel, 33,000-volt switchboard (fig. 16) is directly operated. The standards are rather higher than usual, because the foundation is solid rock, making it necessary to mount the switches well above the ground level in order to provide for a satisfactory bend in the cables. From the end of each duplicate bus-bar 33,000-volt cable connections are taken direct through oil-filled cable boxes to switch-fuses, both of which are mounted outdoors (fig. 17) for controlling the two main 33,000/11,000-volt static transformers. The arrangement of the operating panels carrying the main handle-gear, instruments, and relays is distinctly novel and permitted the adoption of the simplest and shortest runs for the auxiliary connections, which are entirely enclosed within the solid steel-plate standards.

The 11,000-volt switchboard (fig. 19) consists of seven panels, the panel in the centre being for summation purposes; the panel at the remote end controls a transformer, placed inside the expanded-metal screen

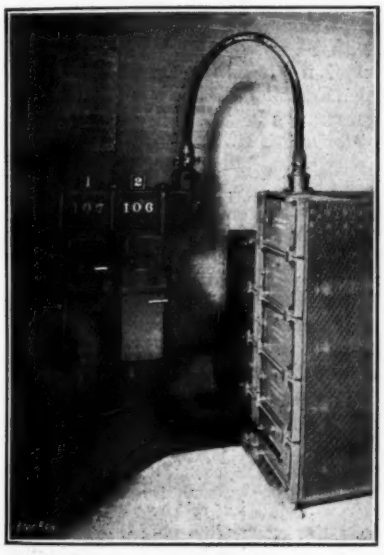


Fig. 18.—Neutral-point Switches.

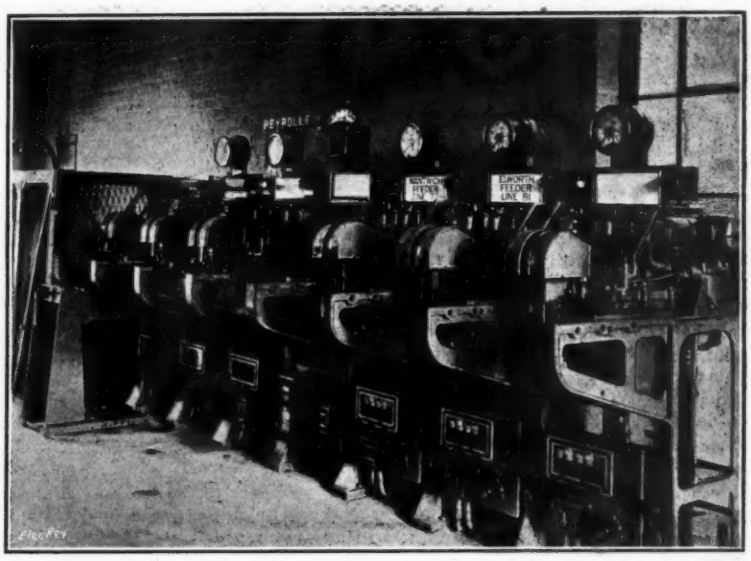


Fig. 19.—Crewe Sub-station 11-kV Switchgear.

Of special interest are the Ferranti tap-changing (on load) transformers and their controls, the magnetic relays being operated by d.c. obtained by means of Westinghouse copper-oxide rectifiers. The two self cooled 3-phase transformers are each of 7,500-kVA capacity, stepping down without switchgear on the 66-kV side to 33 kV; a tertiary winding for 6,600 volts is embodied with a view to the future use of synchronous condensers. The cooling arrangement is unusual and is said to be the first of its kind in this country, the oil flowing through piping (fig. 13) to air-cooled radiators situated beneath the line terminal frame, while fig. 14 is another view of the same equipment showing the air-break isolating switches, which are hand-operated mechanically from the ground level. A bank of "English Electric" booster transformers is installed in the 33,000-V interconnector to Crewe, capable of providing up to 10 per cent. boost on an output of 4,000 kVA. The 33-kV switchgear is housed in a brick building near by, and is of the "HVD" metal-clad type (fig. 15) made by Ferguson, Pailin, Ltd.

The Crewe sub-station contains 33-kV and 11-kV Reyrolle switchgear, and four main transmission lines converge upon it: two from the Mersey Power Co.'s steam generating station at Runcorn and two from the Welsh hydro-electric stations. Duplicate 33-kV works, and on the 11-kV side one overhead line goes to underground cables supply the L.M. & S. Railway the Nantwich district and another to Elworth, Sandbach, and Alsager, supplying the steam wagon works at the far end, used for lighting the sub-station at 400 volts and for other low-voltage apparatus. The next two panels are for the 11,000-volt sides of the two main transformers controlled on their h.p. sides by switch-fuses. Two of the panels at the right-hand end control feeders, and one is a spare. The circuit-breakers are directly-operated, and the standards are of increased height for the reason already mentioned above. In fig. 18 there are shown two directly-operated panels, each for connecting the neutral point of one of the two main transformers on its 11,000-volt side to the earthing resistance shown in the centre.

The North Wales Power Co. is now supplying electricity in bulk to authorised undertakers in 49 towns and villages, and the output of the system reached 38 million kWh in 1927. The principal industries in North Wales and South Cheshire are the slate, granite, and limestone quarries in the west, and collieries and engineering works in the east: the former group of industries absorbed 29.8 per cent. and the latter group 30.85 per cent. of the total energy sold on the Company's system during the past year. The highest simultaneous maximum demand so far recorded on the system was 13,300 kW.

Electricity Distribution of North Wales and District, Ltd., an associated company formed for carrying out distribution schemes in districts not already provided for, purchases energy from the Power Company's system in bulk, and at the present time 32 such points of supply are in operation.

Some Technical Uses of Ultra-violet Radiation.

Ultra-violet rays excite fluorescence, stimulate chemical action, activate vitamins, and sterilise foodstuffs.

By L. V. DODDS.

OF the various types of lamps available for generating ultra-violet rays artificially, the mercury-vapour lamp is the one used most extensively in commercial practice. Since these rays were proved to be so beneficial to health, they have been adapted to numerous technical purposes, and while some of their applications are of scientific interest only, others have considerable economic importance.

Ultra-violet rays are invisible, and by means of a specially-constructed filter it is possible to eliminate all the visible light produced by the lamp. The filter in general use is known as the Wood filter, and is made from a solution consisting of copper sulphate and a deep orange dye, nitrosodimethylaniline, in a container of Uviol blue glass which is permeable to ultra-violet rays. Recent investigations, however, have resulted in the production of a glass almost black in colour, which is much easier to manufacture and gives superior results, so the old method is rapidly being superseded. The lamp, to which a filter of this kind is fitted, is known as the analytic quartz lamp, and the quartz burner is contained in a box-like structure which has arrangements both for observation and also the insertion of a camera lens. In operation, the instrument is used in a similar way to the microscope; that is, the substances are placed inside and examined beneath the rays, but whereas the one enlarges, the other shows the distinctive fluorescence of each substance, and in its precision the instrument approaches the spectroscope. When a substance capable of fluorescing is placed beneath a beam of filtered ultra-violet radiation, the rays are changed into visible light of longer wave-length, and a curious glow is seen which varies in colour according to the substance examined. This is the fluorescence, and scientists have stated that almost every substance is capable of fluorescing, and the unknown can be determined by comparison with the known. The truth of this assertion for every substance has yet to be proved, but certainly a very large number do possess the property, and many extremely interesting and valuable results are being obtained by application of this method.

Textile manufacturers are enabled to detect mildew and bacteriological damage, and also to differentiate between like materials. Breeders of silk worms periodically test their insects to discover any unhealthy ones, because upon this is dependent the quality and quantity of the thread produced. The secreting organ of a healthy silk worm gives a white fluorescence, while the blood fluoresces yellow, and any variation in the colour shades denotes an unhealthy insect.

Criminological investigations have received considerable assistance from this method, and both Scotland Yard and the Bank of England have installed suitable apparatus. In the detection of palimpsests and alterations to documents, filtered ultra-violet radiation is invaluable, because the inks used for the falsifications fluoresce differently from those of the original text, and also from the parchment or paper itself. Counterfeit bank-notes and suspected documents are now examined beneath the rays, and any frauds are obvious at once. Real diamonds glow like beautiful blue lamps, but imitations are absolutely lifeless and dull; pearls can also be separated according to their origin. Besides police authorities, many large jewellery establishments are now using the rays for these purposes. Various poisons are also readily detected, and in several recent cases fluorescence tests for arsenic have been used; in an important murder trial in Berlin such evidence was admitted and was instrumental in securing a conviction.

Students of history have gained much valuable information from deciphering palimpsests with ultra-violet rays. In olden days when parchment was used for writing upon, it was not destroyed when time had rendered the inscription worthless; it was cleaned by chemical or mechanical methods, and used a second or even a third time. In many cases the original script would be of far greater interest than the superimposed text if it were visible, and now by using filtered ultra-violet rays, this can not only be seen, but by means of a method evolved by Prof. G. R. Kogel, of Vienna, it can be photographed also. In the resulting print, the overlying script is seen as if written in outline type, that is, white lettering with a black edge; but underneath can be seen quite clearly the dark grey lettering of the original text. This is possible because the various tints and dyes left in the parchment after the cleaning process fluoresce differently from the later writings.

Many chemical actions are increased and accelerated by the use of ultra-violet rays, and considerable use is being made of this power in industrial processes. Perhaps more important, however, is the fact that the rays are an extremely powerful sterilising agent, and in the preparation of foodstuffs especially this method is being widely used. When various foods are irradiated, the vitamin content is increased, consequently improving the food value, and a combination of these two properties is very effective. For some time past, all the milk used in hospitals and sanatoria has been irradiated, and now means have been devised for the mass production of irradiated dried milk. This is a product desiccated by the revolving double-cylinder process, and it is exposed to the rays of a mercury-vapour lamp in a manner which permits practically the entire surface of any given particle of milk solids to remain within the activating influence of the rays for an estimated period of about one minute. There is no evidence of a disagreeable flavour or odour commonly found in milk products exposed to ultra-violet radiation for a long time, and the usual keeping qualities of the product are apparently unimpaired.

Butter is sterilised by being put on an endless band passing before a lamp, and though there is a slight change in chemical composition, there is but little difference in colour. A large north-country bakery exposes all its bread to the rays, and increased sales denote how the method is appreciated. Butter oils, cod-liver oil, and others containing anti-rachitic vitamins emit a yellow fluorescence, while inactive oils such as olive oil and pea-nut oil show white. When the latter have been exposed to ultra-violet radiation, they show yellow deepening in colour according to the intensity of the rays. This proves clearly the food value of irradiation.

The sterilisation properties are being used extensively in the preparation of canned foods, and recent work on the irradiation of meat and fish foreshadows the adaptation of the method to these industries shortly. In America the water used for making "Canada Dry" ginger ales is sterilised. It is first drawn from the Hudson River, then cleared of suspended solid matter by felt and sand filters, and finally exposed to a battery

of ultra-violet lamps which can deal with 20,000 gallons per hour.

To take a photograph in total darkness seems an impossibility, yet a photographic plate or film is so sensitive to ultra-violet irradiation that visible light can be eliminated altogether. The camera is focused on the desired object, and the line of the beam from the mercury vapour is directed similarly. All illuminations are put out, and an ordinary instantaneous exposure is made. After simple development a negative is obtained quite equal to one taken with magnesium or a similar illuminant. An adaptation of this method is used in the making of micrographs in metallurgy. Difficulty is often experienced in focusing, which requires a fluorescence screen and must be very exact. The advantage is in the fact that some of the constituents of steel which look very much alike when photographed by ordinary light, absorb ultra-violet rays selectively and so appear sharply differentiated under this illumination.

A logical development following upon the therapeutic value of ultra-violet rays to human health is its adaptation for use on plants and animals. In the propagation of growth and the maintenance of health, very many experiments have been made, and the results obtained are very satisfactory. When the action of light on animals and plants is more fully understood, these methods may be of great economic importance and value.

The uses of artificially generated ultra-violet rays are already extraordinarily varied, but as yet the science is of comparative immaturity, so that future developments may be of even greater importance in both technical and therapeutic applications.

Heat Dissipation in Cables.

An investigation into methods for improving the power-transmitting capacity and reducing the cost of underground cables.

By MAJOR A. M. TAYLOR, M.I.E.E., Mem.Am.I.E.E.

(*Concluded from page* 708.)

Details of "Ground Drop" Calculation.

The way in which the ground drop calculation has been worked out is to take the "ground drop" of a single cable all by itself, obtainable by the well-known formula (*Proc.*: I.E.E., May, 1923, p. 542) *viz*:—

$$G = 2/3 \times \frac{120}{2\pi} \times 2{\cdot}302 \log \frac{2L}{r_6}$$

(the thermal resistivity of the soil (g) being taken at 120, and (L) at 60 cm.), and then to find, by an approximate method (given at end of this article), what would be the "equivalent value" of (r_6) for a group of three, or for two, cables, side by side. (It will be granted that any small errors due to the author's method do not apply to case "C" of the said article, and therefore do not affect the figure of 195,000 kilowatts given in Table "A.")

From the investigation at the end of the present article, referred to above, we find that:

(*a*) With 3 cables: $G_a = 36.6$ th: ohms.
(*b*) With 2 cables: $G_b = 37.6$,, ,,
(*c*) With 1 cable: $G_c = 44.2$,, ,,

Hence, the thermal drops in the ground are:

(*a*) With 3 single-core cables (90,800 kW):—$\theta_a = G_a \times (0.199 \times 3 \text{ cables}) = 36.6$ th: Ohms $\times$ 0.597 J. = 21.8 deg. C.

(*b*) With 2 intersheath cables (165,000 kW, 4-phase):—$\theta_b = 37.6 \times (0.336 \text{ J.} \times 2 \text{ cables}) = 37.6 \times 0.672$ J. = 25.2 deg. C.

(*c*) With 1 intersheath cable (195,000 kW 4-phase):—$\theta_c = 44.2$ th. O. $\times 0.336 = 14.83$ deg. C.

(*a'*) With 3 intersheath cables (144,000 kW 3-phase):—$\theta_a' = 36.6$ th. O. $\times$ (0.336 $\times$ 3 ca.) = $36.6 \times 1.007 = 36.8$ deg. C.

By a process of adjustment, with which we need not lengthen the present article, the "internal" drops of all cables have been adjusted to 19 deg. C., and the external drops to 16 deg. C., or a total of 35 deg. C.; which gives a limiting temperature for any part of the cable, of 50 deg. C., taking the "base" temperature at 15 deg. C. (The internal drops are worked out on the lines indicated in the article of August 17th, 1928.)

It may be added, for the sake of those who wish to check these, that the 144,000-kW "intersheath" 3-phase calculations apply to the 195,000-kW intersheath 4-phase calculations, the cables being identical in both cases.

The results obtained may now be tabulated as follows:—

TABLE "A"

Note.—Reduced powers can be transmitted with smaller cables by employing reduced voltages.

"S.T." = supertension cables.

	Internal drop in °C.	Ground drop in °C.	Total drop in °C.	Relative capacitance current per kW.	Relative capital outlay per kW. (cables only).
Town or country.				Ratio	Ratio
"Single-core" cable (3-phase transmission). 82,000 kW transmitted at 132 000 V by six "S.T." cables (two parallel transmissions of three cables each).	19·6	15·5	35·1	3·0 / 1·0	2·8 / 1·0
Town only.					
"Intersheath" cable (4-phase transmission.) 165,000 kW transmitted by five "S.T." cables, comprising two "Quarter-phase" transmissions each "spare" to the other; and a spare "S.T." cable in addition.	20·7	14·0	34·7	1·18 / 1·0	1·18 / 1·0
Open country.					
"Intersheath" cable (4-phase transmission). 195,000 kW transmitted by five "S.T." cables, comprising two "Quarter-phase" transmissions each spare to the other; and a spare "S.T." cable in addition.	19·6	15·3	34·9	1·0 / 1·0	1·0 / 1·0
Town or country.					
3-core cable (3-phase transmission). 20,000 kW transmitted at 33 000 V by ordinary 3-core cables (one cable spare). *Same diameter of cable as for 195,000 kW (o.c.).* Cost will be rather less at 66,000 volts with single-core cables.	19·0	16·0	35·0	1·89 / 1·0	3·5 / 1·0 to 4·0 / 1·0

N.B.—All the ratios given are expressed in terms of the Open-Country Intersheath Cable Transmission.

Example.

It may be helpful to some who read this article if the steps are given by which the 195,000 kilowatts and the 165,000 kilowatts given in Table "A" are obtained from the fully-worked-out case of 144,000 kilowatts (three-phase) given in the earlier article of August 17th, 1928:—

Start with: 144,000 kW (3-phase) dissipating, per cable, 0.336 J and giving 19 deg. C. internal drop, and 36.8 deg. C. ground drop (see present article).

With 4-*phase working* (*i.e.*, two cables in a bunch, instead of three) and at the same kilowatts *per phase* (*i.e.*, per cable), the ground drop, if no other cables were in the vicinity but the pair under consideration, would be 25.2 deg. C. (see present article).

But with 4-*phase working* and the same kilowatts per cable the kilowatts transmitted are obviously*.....192,000 kW
and the "internal" drop is as before.....19 deg. C.

If, now, the cables are all spaced out individually, the "*ground*" drop becomes (see present article).....14.83 deg. C.
the "*internal*" drop remains at .....19.0 deg. C.

Total.....33.83 deg. C.

If we raise the power to 195,000 kW—
the *total* drop is just exactly.....34.9 deg. C.

Similarly, start with 192,000 kW; and ground drop equals 25.2 deg. (two cables in a bunch).

Then reduce the kilowatts to 165,000 kW, and the "*internal*" drop becomes $19\times165^2/192^2$.....14 deg. C.
The "ground" drop becomes $25.2\times165^2/192^2=18.6$ deg. C., and, correcting for the proximity of the two other cables (town conditions) we get.....20.7 deg. C.

Total drop at 165,000 kW.....34.7 deg. C.

In a similar way the 82,000 kW of Table "A" can be deduced from the 90,800 kW given earlier in the present article.

Comparison with Overhead System.

For a comparison, it may be conceded that an underground system, consisting of two separate circuits, and capable of transmitting full load (195,000 kW), after one cable breakdown, may be compared with a double-tower 100,000-kilowatt overhead line, each line being capable of transmitting, on emergency, 100,000 kW, if anything approaching equal conditions of security is to be maintained.

(The reason for taking 100,000 kW for the overhead line, rather than 195,000 kW, is that the smaller figure sufficiently covers present possibilities with overhead lines, without introducing questions of transmission line stability. It is, of course, somewhat unfair to the underground cable.)

Alternatively to a double-tower line, two single-tower lines, arranged as part of a "ring main," as proposed between Edinburgh and Glasgow, may be considered; each transmitting normally 50,000 kW, but capable of an emergency load of 100,000 kW, continuously.

* (144,000×4/3=192,000.)

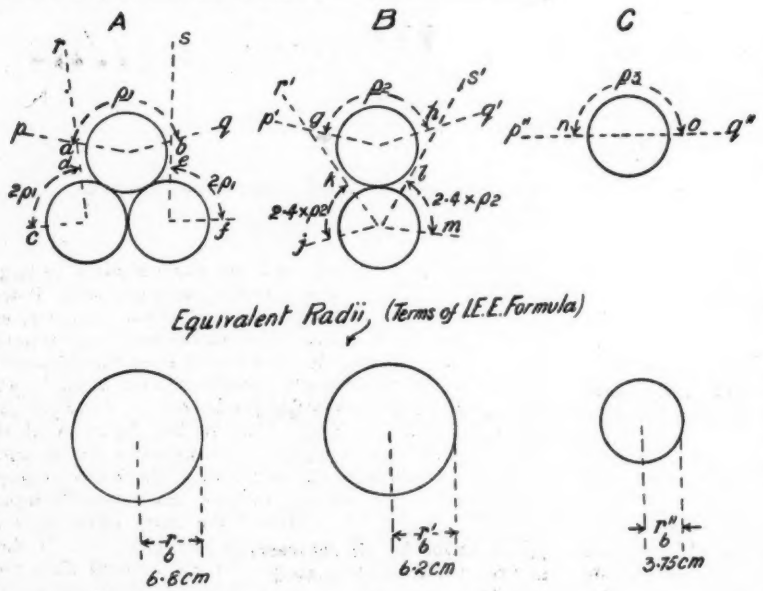


Fig. 4.

Taking the estimate of £2,500 per mile provided by Mr. J. S. Highfield (in his paper read before the World Power Conference) for the transmission of 50,000 kW per tower line, and increasing this to £3,000 (to allow of the doubled power), we obtain the figure of £6,000 per mile, for two lines of towers.

Dealing only with "fixed charges," we have:—

INTERSHEATH CABLES:—

	Say	
Capital investment in cables, per kilowatt, per mile of route	£.095	
Interest and sinking fund at 8 per cent on £.095 (for 195,000 kW)	£1,370 per mile per annum.	
Maintenance at, say, 5 per cent.	£855	,, ,,
Total fixed charge ...	£2,225	,, ,,

Fixed charge per unit at 40 per cent. load factor = .00078d. per mile per unit transmitted.

OVERHEAD SYSTEM:—

Capital investment, per kilowatt, per mile of route	£.060	
Investment and sinking fund at 10 per cent on £.06 (for 100,000 kW)	£1,080 per mile per annum.	
Maintenance at, say, 10 per cent.	£1,080	,, ,,
Total fixed charge (per 100,000 kW)	£2,160	,, ,,

Fixed charge per unit at 40 per cent. load factor = .00148d. per mile per unit transmitted.

The running charges are not taken account of here, as they are common to the two systems, and therefore do not affect the comparison.

Asregards the need for two lines of towers, the following standard has been put forward before the Am. I.E.E. by Mr. L. E. Imlay:—"Two tower lines, each supporting two circuits, each power line with its circuits being capable in emergency of transmitting the entire load, would reasonably ensure continuity of service of the character demanded by the Metropolitan District of New York city."

Investigation of Relative Thermal Ground Resistances.

An investigation of the approximate relative thermal "ground resistances," under the three conditions assumed earlier in the present article will now be made, *viz.*:—

(*a*) Three cables, each having an external radius of approximately 3.75 cm., in contact with one another, and at a depth of approximately 60 cm.
(*b*) Two cables, each having an external radius of approximately 3.75 cm., in contact with one another, and at a depth of approximately 60 cm.
(*c*) One cable: at least 1 ft. from any other cable.

It will be clear that the thermal resistances at the contact of the earth with the surface of each cable, due to the "gathering" of the lines of thermal flow into the cable, or group of cables, can be expressed as an "equivalent radius" of the cable and inserted into the standard equation for the "ground resistance," *viz.*:—

$$G_{a,\ b,\ \text{or}\ c}=2/3\times120/2\pi\times\log_e(2L/r_e)$$

where r_e is the "equivalent radius," in each case; and the thermal resistivity g of the soil is taken at 120 and L is the depth in cm.

Referring to fig. 4, the sub-diagrams A, B, C represent, respectively, the three conditions *a*, *b* and *c*.

Consider the left-hand diagram and treat it as a case of magnetic leakage. The leakage (in an upward direction) from the topmost lead sheath would appear to be reasonably defined as restricted to the arc *ab*, embraced between the limitations *p* and *q*, while on the lower lead sheaths the arcs *cd* and *ef* would appear similarly to meet the case.

The "resistance" of the arc *ab* may be expressed as ρ_1, while the "resistance" in each of the other arcs may be expressed as $2\rho_1$.

Let R_A = joint resistance of the three arcs;

then $1/R_A = 1/\rho_1 + 1/2\rho_1 + 1/2\rho_1 = 4/2\rho_1$

or: $R_A = 2\rho_1/4$

Consider the middle diagram; we may assume that the two arcs *jk* and *lm* are each equivalent in resistance to $2\rho_2$, the resistance of the arc *gh* being equal to ρ_2.

Let R_B = joint resistance of the three arcs;*

then $1/R_B = 1/\rho_1 + 1/1{\cdot}2\rho_1 = 2{\cdot}2/1{\cdot}2\rho_1$

or: $R_B = 1{\cdot}2\rho_1/2{\cdot}2$

Dealing with the right-hand diagram C, the arc *no* may be assumed to have a resistance $\rho_3 = \rho_1/1.1$, because the effective "arc of leakage" is a little longer than in A, say, 10 per cent. longer. (See also note later).

Then $R_C = \rho_1/1.1$.

Hence, collecting together

$R_B/R_A = 1.1/1.0$ and $R_C/R_B = 1.65/1.0$ (approx).

* *Note*: ρ_2 is equal to ρ_1.

Hence, if we assume that the "equivalent radius" r_e is, in the three cases, A, B, C, simply inversely proportional to the relative resistances and remembering that we know the value of r_e for the case C, which is 3.75 cm., we may state these "equivalent radii" as follows:—

$r_{e(a)} = 6{\cdot}8$ cm.
$r_{e(b)} = 6{\cdot}2$ cm.
$r_{e(c)} = 3{\cdot}75$ cm.
} as shown on the lower diagram of fig. 4.

Putting these values into the standard equation for the ground resistance, we have:

$G_a = \frac{2}{3} \times 120/2\pi \times 2\,302 \times \log 120/6{\cdot}8 = 36{\cdot}6$ Th. O.
$G_b = \frac{2}{3} \times 2' /2\pi \times 2{\cdot}302 \times \log 120/6{\cdot}2 = 37.6$ Th. O.
$G_c = \frac{2}{3} \times 120/2\pi \times 2{\cdot}302 \times \log 120/3{\cdot}75 = 44{\cdot}2$ Th. O.

which are the values employed in the earlier calculations in the present article.

(It has not been thought necessary to deal in detail with any leakage taking place in a downward direction. The author has considered such leakage, and feels satisfied that no serious error is introduced as regards the apportionment of the surface resistance in the cases *a*, *b*, by neglecting this downward leakage; and it is on the relation between these two cases that the corrections for two-phase working, in relation to three-phase working, depend.)

It will also be clear that in case *c*, where the four cables are all spread out in one plane, equithermal points are established in that plane, which tend to prevent the flow of heat in a downward direction from any cable, and so tend to shorten the arc *no* from a wider "arc of embrace" to the value shown in sub-diagram C of fig. 4.

The International Illumination Congress.—IV.

An Account of the Tour in the United States, and the World Congress at Saranac.

(By OUR OWN CORRESPONDENTS.)

AFTER dinner, a visit was paid to East 152nd Street to witness what is aptly described as "forty streets in one." By arrangement with the Cleveland Illuminating Company and the City authorities, forty different lighting installations were installed about four years ago, and the installation is maintained for giving demonstrations to street-lighting authorities from all parts of the States. This unique exhibition was much appreciated by the international delegates, and the experiments made were useful in the discussions at Saranac Inn. We arrived at Detroit on September 13th, and were met by officials of the Detroit Edison Company. Mr. Alex. Dow, president of the Company, who is so well known to engineers in England, was much in evidence in helping to make our short stay enjoyable and profitable. Our visits during the day included the Ford works, where we saw the new model car being assembled on one of the bays at the rate of 45 each hour As an example of high-intensity lighting the Fisher Body Works was a revelation. In the spraying and finishing departments 500-watt lamps in special fittings are employed, giving an intensity of about 150 foot-candles.

Our hosts had made special arrangements for the banquet which was held in the roof garden of the Book Cadillac Hotel. Special colour lighting was installed above the glass roof, and during the musical interludes the lighting was changed to suit the *motif*. Professor Higbie presided at dinner and introduced as principal speaker Dean Herbert Sadler, from the University of Michigan, who made a plea for modern ideas in engineering training. Our indefatigable president Paterson, who had made speeches at most of the banquets, excelled himself on this occasion in his inspiring remarks concerning the lessons to be learnt from the wonderful organisation of Detroit's industries. Dr. Adolph, who also spoke, was loud in his praises for the foresight and enterprise of Mr. Alex. Dow in his direction of the Detroit Edison Company. M. Cellerier in a witty speech expressed thanks on behalf of the French delegation. Major Callaghan, president, Associated Technical Societies of Detroit, outlined the many advantages of joint action by all engineering interests. Mr. H. Lofquist explained the success of the Electrical Extension Bureau in increasing the number of plugs and outlets as a result of the Red Seal wiring plan, which is, in effect, a specification for adequate wiring. The work of Miss C. Haslett and the Electrical Association for Women is frequently referred to here, and there is a general desire on the part of the ladies to acquire detailed information regarding the activities of that organisation, and in particular the "outlet" campaign which it is at present sponsoring.

After a very tiring, but intensely interesting, day at Detroit we returned to our special train *en route* for Chicago, where we arrived in the early morning of September 14th. The reception committee, under the direction of Mr. E. W. Lloyd of The Commonwealth Edison Company, had spared no pains or expense to make our stay of two days pleasant and profitable. There was so much in this progressive city for us to

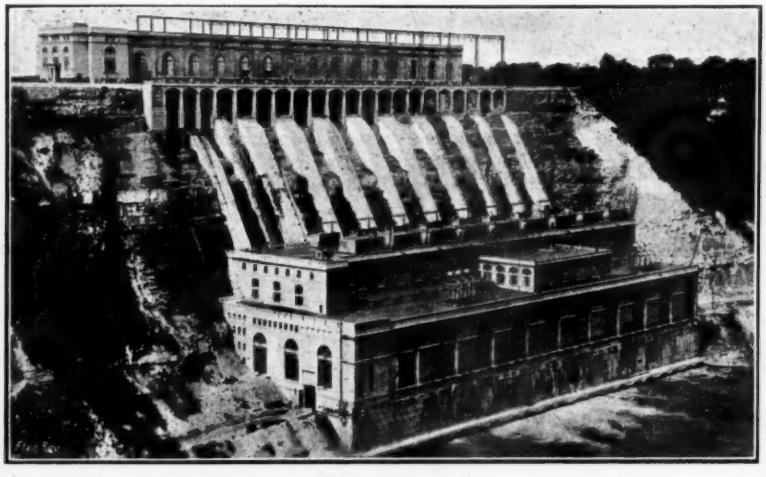
see that it was found necessary to arrange alternative programmes covering ten different trips. They included visits to the building of "Curtis Lighting," where the X-ray reflector and indirect illumination originated; the Commonwealth Edison electric shops; the showrooms of the National Lamp Works of the General Electric Company, Midland Federal Division; Crawford Avenue generating station of the Commonwealth Edison Company; Western Electric Company, Hawthorne Plant, where 39,000 persons are employed; the Straus Building, where the radio broadcasting station WENR is housed; and many other places of electrical interest.

Our headquarters in Chicago were at the Palmer House Hotel, and it was here that we were received by Mr. E. W. Lloyd and Mr. O. R. Hogue, chairman and vice-chairman, respectively, of the Chicago Committee. After inspecting many places of interest, including the University of Chicago and the Field Museum, we were entertained at luncheon at the South Shore Country Club, which is one of the finest in the country. It is not possible to describe in detail the many interesting institutions which we visited in the afternoon, but the delegates were unanimous in the conclusion that Chicago is an extremely progressive and enterprising city.

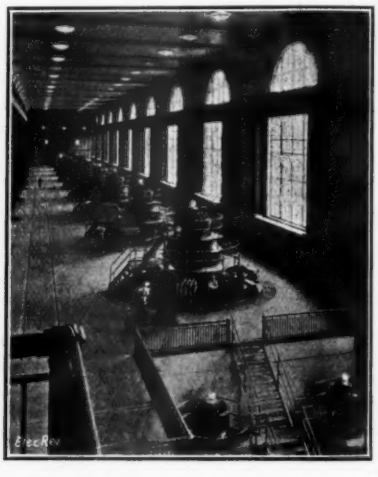
The official banquet was held at Palmer House, where we enjoyed the unbounded hospitality of our Chicago hosts. Mr. Lloyd in his speech enlarged on the successful development of the city's industries, and gave details concerning its phenomenal growth in recent years. Suitable responses were made by our President and Professor Teichmuller, of the University of Karlsruhe. The latter, in a witty speech, compared the experiences of Columbus and himself in their respective discoveries of America.

On the following morning we continued our high-speed tour of the city's industries and places of interest The luncheon on this day was of special interest, since it was here that Mrs. Paterson made a gracious speech of thanks to the American ladies who had shown such extreme kindness and thoughtfulness for the ladies who were attached to the foreign delegations. Mr. Tommy Atkins, of the Electric Storage Battery Company, who is an Englishman long resident in Chicago, also addressed the gathering. We had a very pleasing diversion in the afternoon, our hosts having chartered an obsolete gunboat for a trip on Lake Michigan. In addition to providing us with a much needed rest, the occasion enabled the delegates to have informal conferences which served us in good stead later on in the programme.

The whole party was much refreshed on reaching the train, which departed at 10 p.m. for Niagara Falls, where we arrived in the early morning of Sunday, September 16th. Needless to say, most of this day was occupied by trips to inspect the Falls from various viewpoints. Our hosts, who were the Hydro-Electric Power Commission of Ontario and the Niagara Falls Power Company, had provided special 'buses for our convenience and comfort. It was after dark that we witnessed one of the most beautiful and magnificent spectacles of the whole tour. Mr. W. D'Arcy Ryan, illuminating engineer of the General Electric Company, in collaboration with the local committee, had arranged a special display supplementing the lighting installation which is used for lighting the Falls. Prior to the demonstration, we were given an opportunity to inspect the installation, consisting of twenty-four 36-in. searchlight projectors fitted with colour screens, each of which is estimated to give an end-on candle-power of sixty millions. A special programme of lighting had been worked out for the occasion, and as we moved to the various points of vantage, the well-drilled operators varied the sequence of projection and colour of light on the Falls, which provided a most brilliant and scintillating effect, impossible of adequate description. It was obvious that special publicity had been given in advance of this special display, since hundreds of thousands of spectators were to be seen at various vantage points on both the American and Canadian shores. In many places cars were parked four deep, the roofs being used by many for special stands. The *pièce de résistance* of the demonstration was the projection by means of a specially constructed projector of a silhouette of the Maid of the Mist, which was superimposed in white over the coloured illumination of the Falls.



Queenston Hydro-electric Station; 507,000 h.p. at 305 ft. Head.



Turbine Room at Queenston; five 55,000-h.p. and four 58,000-h.p. Sets.

Before leaving Niagara we had an opportunity of inspecting the Queenston generating station of the Hydro-Electric Power Company and the Schoellkopf station of the Niagara Falls Power Company.

The visit to Niagara was a memorable one for the magnificence of the spectacle which we witnessed, the cordial reception and hospitality which were accorded us by the local committee under the chairmanship of Mr. W. K. Bradbury, and also because this was the last occasion on which we should board our special train before completing Part I of the Congress programme in the form of the highest-speed tour which had ever been organised in this remarkable country.

Considerations of space and time have made it necessary to curtail the descriptions of the places visited and the generous hospitality and friendliness which had been accorded to us at every point, but every member of the delegation was full of gratitude and admiration for the progressive spirit which permeates the whole electrical industry in the United States, and for the cordial spirit in which our hosts received us.

The New "Magnet" Works.

The General Electric Co., Ltd., has recently established a new works in Central Birmingham, with a total floor area of about 10 acres, for the manufacture and development of domestic and industrial electrical appliances.

THE recent developments in the electricity supply industry in this country have led the General Electric Co., Ltd., to acquire and equip an extensive and conveniently situated group of factories in Landor Street, Birmingham, which has been rechristened "Magnet" works, for the manufacture of domestic appliances, industrial heating apparatus, and electric lighting fittings and accessories. There was a Press visit to these works, which cover 10 acres of manufacturing floor space, on October 19th. The works are positioned with a wide frontage to the main London - Birmingham railway line, fig. 1, and adjoin both the main L.M.S. lines which pass through Birmingham. A private siding serves the works. The main factory consists of a three-storey building arranged in four intercommunicating blocks; in all there are eleven spacious bays, each being 300 ft. long and 50 ft. wide. Grouped around are several extensive workshops and a large administrative building. The lay-out and equipment of the works are so arranged that there is a regular and ordered flow of material continually available in each department. One of the bays in the main workshop forms a bright and airy works canteen, divided in the middle by an electrically equipped kitchen.

Fig. 1.—"Front" of Magnet Works.

The principal sections of the works devoted to the various preliminary operations to parts before assembly are the casting, grinding, press, capstan, general-machine, sheet-metal, and industrial heating and cooking equipment machine shops. The press, capstan, and general-machine shops are principally concerned in quantity production of components required for domestic electrical appliances and electric light accessories. In the press shop, for example, the body of an electric kettle is pressed from a circular sheet of copper; the two halves of the kettle's spout are similarly produced and subsequently soldered together, with an invisible joint. These shops contain many rows of machinery engaged in repetition operations. The machine tools in the industrial heating and cooking machine shop are of an entirely different character; they comprise punching and shearing machines, flattening rolls, and the like, of a very robust construction in order that they may perform rapidly the necessary operations upon the heavy plates required in the construction of large baking ovens, furnaces, and so on.

Two of the main bays are required for the assembly of domestic appliances, and a third bay is earmarked for the same purpose. In one of these bays the smaller ranges of appliances are handled, including irons, kettles, toasters, saucepans, radiators, and so forth, while, in the other, electric cookers, water boilers and the larger apparatus are constructed. In the former bay also the resistance elements for irons, kettles, fires, and so on, are wound. Fig. 2 shows the domestic cooking appliances assembly bay.

Fig. 2.—Domestic Cookers Assembly Shop.

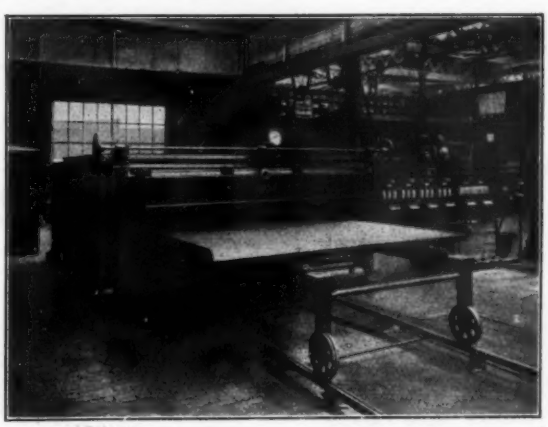


Fig. 3.—Large Electric Draw-plate Oven.

In the production of the heavy apparatus, electric welding and cutting are used extensively, and each oven

or furnace is so built that, apart from the design of the electrical system, the whole structure is in accordance with sound mechanical principles. Fig. 3 shows a large electric draw-plate oven in the industrial heating section. In the electric light fittings shop many fascinating processes are to be seen. These originate in the brass foundry, where skilled operatives are engaged in casting from molten brass the various components of the many types of fittings made. The rough castings, after careful examination, are taken to the stores and then to the making-up and chasing shop, where craftsmen impart finishes which cannot be obtained by machinery. The parts are next taken to the dipping, polishing, and plating or metal-colouring shops, where they are given appropriate finishes in oxidised silver, copper, silver plate, antique brass, and so on, and then they are lacquered. After treatment in the capstan and press shops, fig. 4, it is, of course, necessary to anneal the components of electric light accessories—switches, lampholders, and the like. The parts are stacked in trays and treated in a large electric furnace, which was made in the industrial heating section of the works. This furnace, fig. 5, is loaded at 80 kW, and works on 440 V, 3-phase, 25 cycles. Resistance heaters are fitted under the hearth plate and in the side walls. The furnace body is built up of sheet-steel and angle-iron, and the heat insulation is such that the exterior of the casing is not appreciably warm to the hand. A movable loading shelf is fitted in front to enable the furnace to be loaded and emptied easily. Alongside the furnace is the automatic temperature control gear and main switch with a three-pole contactor, by means of which the furnace can be automatically maintained at any desired temperature up to a maximum of 1,000 deg. C.

Fig. 4.—Capstan and Press Shops for Electric Lighting Fittings.

Fig. 5.—Electric Annealing Furnace: 80 kW.

Fig. 6.—Appliances Testing Department.

The assembly of electric lighting accessories is carried out on the top floor of one of the bays. The staff employed for the delicate handling operations involved is almost entirely female, and it is most interesting to watch the extremely rapid manipulative skill shown by the women and girls in producing the finished accessories. Housed in a building adjacent to the packing and dispatch department is the testing house, fig. 6, where all the domestic electric heating and cooking appliances are dealt with. Suitable testing boards are equipped with the necessary instruments, while motor-generator plant is provided to furnish any voltage required for the particular appliance under test. Boiling appliances, such as kettles, are subjected to a boiling test to ensure that the temperature of the liquid is raised by a definite amount in a given time. A special testing board for domestic cookers is installed, and each cooker is placed on test for one hour, during which time the current consumption is checked.

Two bays of the main building are fitted up as the G.E.C. central stores, where are carried immense stocks of several important lines of the company's manufactures. These stocks are so arranged that demands from the Company's head office or branches can be immediately satisfied. Throughout the works is installed a system of lighting based on modern methods of factory illumination. "GECo" dispersive-type enamelled-steel reflectors fitted with "Pearl Osram" lamps are used throughout, and intensities varying from 5 to 12 foot-candles are provided at the plane of work.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Metro Vick. and B.T.-H. Companies.

Statements have appeared in the Press regarding important developments in the electrical manufacturing industry. These follow on movements and announcements which have been reported in our columns from time to time in recent months. The gist of the statements is that the Metropolitan-Vickers Electrical Co., Ltd., has acquired, or is acquiring, a majority of the ordinary shares of the British Thomson-Houston Co., Ltd., consequently gaining control of that company, the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd. Until 1919 the Metropolitan-Vickers Co. was the British Westinghouse Electric & Manufacturing Co. Prior to the change of name, the capital of the company was transferred to British hands, and Vickers, Ltd., acquired control. Later the latter company's holding was taken over by the International General Electric Co., but early this year Mr. F. Dudley Docker announced that the control of the company had passed to him. In our issue of March 23rd (p. 519), reporting the company's annual meeting, we quoted Sir Philip Nash (chairman) as saying that "Mr. Docker had had a close and intimate relationship with the company since 1918. He then had in view the formation of a consolidated electrical undertaking on the lines of similar undertakings existing in Germany and America. . . . He had come back into the industry to lend his aid and use his unequalled experience and great influence in the pursuit of a policy of co-operation within the industry on similar lines to those which he was contemplating as far back as 1918. The reappearance of Mr. Docker in the affairs of the company was accepted with great satisfaction by the board and staff as an indication that the troubles and difficulties with which the industry had for years been surrounded would be actively and seriously tackled with the best chance of a successful solution. The permanent solution would not be reached until Great Britain possessed an electrical engineering corporation resting on sound foundations and so organised as to compare favourably with the undertakings in Germany and America." At the last meeting of the British Thomson-Houston Co., Ltd. (reported in our issue of May 11th, p. 831), the chairman, Mr. H. C. Levis, said that "arrangements had been made with the Metropolitan-Vickers Electrical Co., Ltd., which were expected to lead to eliminating unnecessary duplication of effort and expenditure, and to effecting economies generally in various directions, such as research, engineering development, manufacturing processes, and the purchase of materials. Progress had been made in a similar direction with the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd." Later he said that "all of the debentures and preference shares were held in Great Britain, while the International General Electric Co. held a large block of the ordinary shares and all of the unsecured debt."

The total assets of the four companies involved are estimated at over £15,000,000. The *Financial Times* states that steps are being taken to change the name of the Metropolitan-Vickers Company to one more comprehensive, and certain changes will be made in the board of directors, and the number increased, so as to include representatives of the various financial interests associated with the enterprise. Mr. H. C. Levis will be chairman and Sir Philip Nash managing director. The majority of the shares, including the voting shares, will be owned by British holders. It is not intended that the activities of any of the four companies should be curtailed, but that they should actively co-operate under the general guidance of a central board. The business of the Metropolitan-Vickers Company will continue to be carried out by an existing subsidiary company (all the shares of which it now owns) called "Metro-Vick Electrical Products."

(It is possible that our contemporary refers to Metro-Vick Supplies, Ltd.; we cannot trace a company of the name given.)

The Factory Lighting Campaign.

In a progress report to October 26th, the British Electrical Development Association states that it has received 2,010 inquiries for further information on the subject of improved lighting for factories and workshops, in reply to the Campaign booklets and circulars. Further to the area conferences already mentioned by us, conferences have been held at Cardiff (lecturer, Mr. H. Lingard; chairman, Mr. C. G. Morley New) and Edinburgh (lecturer, Mr. H. E. Hughes; chairman, Mr. E. Seddon). Ninety-four lecture-demonstrations to factory owners and executives have been, or are being, organised, 29 having already been held. The report contains particulars of these functions, which are to take place in the next few weeks in all parts of the country. The Birmingham Circle has arranged for Mr. J. L. H. Cooper to give a lecture in demonstration workshops and offices on each Thursday from November 8th to December 6th. A number of the largest manufacturing firms in the country have placed their new works at the disposal of the organisers for the purpose of holding lecture-demonstrations in modern works. In addition to lectures to industrial consumers, efforts are being made to address various organisations connected with industry, such as welfare workers, trade unions, technical institutes, associations, and engineering societies.

Japanese Exports to India.

Japanese manufacturers of electrical goods are steadily increasing their trade connections in India. The following table, compiled from a recent return, shows the value of the imports of Japanese material into India during the past two years:—

	1927. Rupees.	1926. Rupees.
Electric wires and cables	14,004	33,927
Electrical fittings	117,561	95,640
Electrical apparatus (including telegraph and telephone)	291,981	226,304
Totals, rupees	423,546	355,871

A Reported International Cable Understanding.

A correspondent states that negotiations are reported to be proceeding between the leading makers of high-pressure cables with a view to the establishment of a syndicate. All countries in Europe are said to be taking an interest in the scheme, but for the present manufacturers in the United States are not participating in the discussions. It is declared that the negotiations are taking a promising course, although as a result of the large number of undertakings, it will not be easy to overcome the difficulties of reaching an understanding, as the industry in most countries, exclusive of Germany and England, is not in the hands of an organisation. It is said that the very keen competition in cables in international markets is giving the movement a strong impetus.

The Marking of Imported Rubber Manufactures.

The Board of Trade Standing Committee (General Merchandise) appointed under the Merchandise Marks Act, 1926, is to hold an inquiry on November 5th and 6th, and, if necessary, November 12th and 13th, as to whether certain rubber manufactures should bear an indication of origin upon importation into this country. The goods in question include rubber gloves and mats and manufactures consisting wholly or mainly of rubber, including ebonite, vulcanite, and articles thereof.

Overseas Electrical Trade: Volume and Values.

The *Board of Trade Journal* publishes statistics of our foreign trade for the first nine months of the current year and after reducing values to the 1924 equivalents compares quantities and values with those for the first nine months of 1924. Dealing in this way with exports of electrical goods and apparatus it is shown that average values fell to 94.6 per cent. of the 1924 level, while quantities rose to 127.9 per cent. As regards imports, average values fell to 89.8 per cent. and quantities rose to 165.8 per cent. of the 1924 levels.

An Electrically-equipped Linoleum Factory.

The North British Linoleum Co., Ltd., has erected at Dundee what is claimed to be the most up-to-date and scientific linoleum works in the country. Electricity is supplied by the Corporation, and the sub-station has been equipped with the latest of apparatus by well-known makers. The transformers were supplied by the Foster Engineering Co. The motors in the factory were supplied by the British Thomson-Houston Co., Ltd., Crompton Parkinson, Ltd., and Messrs. Walter McGee & Sons, Ltd. Messrs. Edmiston, Brown & Co., Ltd., carried out the power installation, and Messrs. Maxwell (Dundee), Ltd., the lighting installation. An electric goods lift was provided by Messrs. Wm. Wadsworth & Sons, Ltd.

A Pocket Soldering Outfit.

We have received from Elmesan (London), Ltd., 66, Victoria Street, S.W.1, a very compact soldering set which, while quite adequate for its purpose, can be carried in the pocket. In a tin box measuring only 3¼ in. by 3 in., there is a soldering iron with a screw-on handle; a supply of solid fuel with a little tripod on which to place it; a stick of solder; a tin of "Fluxite"; and, as an alternative to the last two items, a tin of "Soldo" compound combining flux and solder. In addition, there is a small instructional pamphlet which succinctly explains the use of the outfit.

United States Electrical Exports.

The total value of electrical goods and apparatus exported from the United States during August was $8,723,329, as compared with $8,267,438 in August, 1927, the highest figure for the past six years. The principal increases were shown by the following classes:—Steam turbo-generator sets, from $19,531 to $137,261; motor starting and controlling equipment, from $75,910 to $137,684; accessories and parts for motors, from $234,575 to $316,646; radio transmitting sets, from $9,742 to $74,636; receiving sets, from $183,402 to $350,994; ignition apparatus, from $138,238 to $222,922; and carbon furnace electrodes, from $154,867 to $200,976. Large decreases were recorded for the following classes:—Accessories and parts for generators, from $112,358 to $58,860; self-contained lighting outfits, from $148,314 to $74,930; storage batteries, from $306,815 to $213,418; rectifiers, motor convertors, &c., from $253,074 to $114,270; motors from 1 to 200 h.p., from $292,844 to $228,611; railway motors, from $89,598 to $450; flashlights, from $223,248 to $172,422; motor-driven household appliances, from $169,201 to $92,451; and telephone apparatus, from $338,128 to $254,474 Canada, of course, was the principal market, her share of $2,538,320 representing over 29 per cent. of the total. Australia and Argentina were next, with shares of $568,751 and $564,586 respectively. The United Kingdom, with $453,243, followed, and other important customers were Mexico ($428,396), Brazil ($358,990), and Japan ($345,243). The exports for the first eight months of the year totalled $71,907,905 in value, as compared with $66,000,387 in the corresponding period of 1927.

South-East England Scheme Contract.

In the advertisement pages of this issue the Central Electricity Board invites tenders for the supply, delivery, and erection of 132,000-V transformers in connection with the South-East England Electricity Scheme.

New Belgian Companies.

Among the companies recently registered in Brussels are the following: The Union Financière d'Electricité et de Transport, capital 270 million francs, in which a number of electrical and other companies in Belgium and abroad are participating; and the Forces Electriques, S.A., capital 9 million francs, to construct and assist in constructing electrical installations in Belgium, the Belgian Congo, and elsewhere.

Polish Electrical Imports.

The imports of electrical machinery into Poland during the first six months of the current year were valued at £1,188,500, as compared with £954,000 in the corresponding half of 1927. During the same period the imports of electrical fittings and supplies advanced from £779,310 to £935,630.

Unemployment.

During the week ended October 15th there was an increase of 1,500 in the number of registered unemployed, the total rising from 1,319,700 to 1,321,200. On October 17th, 1927, the figure was 1,071,300.

The Post Office Foreign Contracts.

The discussion which arose out of the placing of contracts in France and Germany for bronze wire by the General Post Office has been carried a stage further by another statement by Mr. Thomas Bolton, chairman of the Non-Ferrous Metal Group of the F.B.I. In this, Mr. Bolton expresses regret that the Post Office should have accused British manufacturers of attempting to obtain public contracts at unreasonable prices. "The Post Office's comparison between the prices quoted by British and foreign manufacturers gives the impression that there is a difference of between 30 per cent. and 40 per cent. in favour of the latter in the prices for a finished product. These percentages are based on a calculation which omits the cost of raw material. When translated into terms of the actual price to be paid by the department the facts are that the foreign prices were from £92 10s. to £93 10s. per ton, against the British price tendered of £102 per ton. The difference, in other words, is not 35 per cent. to 40 per cent., but approximately 8½ per cent. This difference is more than accounted for by the lower labour costs of the foreign manufacturers. The price which was refused by the British firms was about £97 per ton, but at the price tendered the profit to the British manufacturer was 3½ per cent., as proved by an auditor's certificate. As this omitted any allowance for overhead charges, the price which the British firms tendered would have represented a loss, which they were willing to shoulder in order to keep their workpeople in employment. The letter from the General Post Office further attacks the principle of collective negotiation, and suggests that this is responsible for forcing the public to pay an unreasonable price. The facts are that the bronze wire trade is a small one, as there is practically no demand for this commodity except from the G.P.O. Only six firms have been induced to take up the production, and the practice has been for consultation as to price to take place between the officials of the G.P.O. and these firms before formal tenders are sent in. This practice has, in fact, been for years the recognised basis upon which the Post Office has placed orders for the material in question."

The American Contractors' Journal.

The October *Electragist*, the official organ of the Association of Electragists—International (contractor-dealers), announces that as from its next number it will be merged with *Electrical Contracting*, a new magazine, which is to be published in Chicago. It will remain the organ of the Association, although it has been purchased by the Electrical Trade Publishing Co.

American Radio Manufacturing Licences.

The *Wireless Trader* reports that the U.S. Circuit Court of Appeals has confirmed the decision of a lower court that Clause 9 in the licence granted to manufacturers by the Radio Corporation of America violates the Clayton "restraint of trade" laws. This clause stipulates that the licensees shall employ only valves made by the R.C.A. for sets made under the licence.

Mr. David Sarnoff, of the Radio Corporation of America, stated that the clause was inserted upon counsel's advice after a legal decision in an earlier case involving substantially the same question of law as the present case. He announced the Corporation's intention of appealing against the decision to the Supreme Court of the United States.

The International Glow Lamp Syndicate.

The annual meeting of the International Glow Lamp Syndicate, the members of which represent all the leading works in Europe, America and Japan, has just been held in Budapest. Besides current business matters, the conference had under consideration technical questions which aim at a far-reaching "rationalisation" of the manufacture of glow lamps.

New French Companies.

A company has been formed in Paris (75, Boulevard Haussmann) with a capital of 600,000 fr., and the title La Société pour les Applications d'Electricité (Valenciennes-Cambrai), to establish electric power stations in Northern France.

La Société de l'Energie Electrique de la Région Toulousaine has been formed in Paris (25, Avenue du General Foy) with a capital of 2½ million francs, to extend the electricity supply facilities in the Toulouse district.

The Approach of Christmas.

One of the first signs of the proximity of Christmas comes from the General Electric Co., Ltd. It takes the form of a number of suggestions for presents, all of which are most appropriate for the purpose, being both handsome and useful. The range of prices, too, is such as to suit all pockets. The appliances put forward rise from the humble, but useful, iron to the more expensive washing machine and cooker.

Irish Electrical Exports.

A return issued by the Irish Free State Department of Industry and Commerce shows that electrical goods of the country's manufacture to a value of only £3,227, were exported from the Free State during the first six months of this year, as compared with £8,840 in the corresponding period of 1927.

The British Industries Fair.

So great has been the growth of the Birmingham section of the Fair that the organisers, the Birmingham Chamber of Commerce, have decided to create an outside section adjoining the Fair buildings, with an area of 50,000 sq. ft. Already plans are being made for extensions to meet the needs of the 1930 Fair. It is considered necessary to extend the buildings to the northern boundary of the area, adding 62,000 sq. ft. to the floor space. Developments will also be made to the east into the present car park, giving a further 39,600 s. ft. These additions will bring the total available space up to about 580,000 sq. ft.

A Belgian Radio Exhibition.

A radio section is being included in the 22nd annual Belgian Motor Exhibition, which is to be held in Brussels from December 8th to 19th next. The section promises to be fairly extensive, over forty firms having already taken space.

The F.B.I. and Taxation.

A statement of the taxation policy of the Federation of British Industries has been made, and a number of matters to which the attention of the Chancellor of the Exchequer is to be drawn are set out. The Federation is to continue to press for a reduction of income tax and the restoration of the penny post. It also considers that the costs of proceedings in Merchandise Marks inquiries should be treated as business expenses, and not as capital charges. The Chancellor will be asked to expedite negotiations with foreign countries for the removal of the double taxation of profits system; to remove an anomaly with regard to the payment of stamp duty upon amalgamations; and to consider the question of the liability of the reserves of certain limited companies to super-tax.

The Greek Telephone System.

It is reported from Athens that the Government of Greece has instructed the Minister of Communications to investigate the question as to how Greece can withdraw from the agreement entered into two years ago for the establishment of a new telephone network in Athens and other Greek towns, as it wishes to conclude an agreement with another firm. As a consequence, the Minister is to invite, it is said, representatives of the firm of Siemens & Halske to Athens to enter into negotiations.

Unemployment Grants.

In its latest report the Unemployment Grants Committee gives particulars of assistance afforded to local authorities and public utility companies up to the end of June last. The assistance takes two forms, *viz.*, loan schemes under which the grants consist of a percentage of the interest, or of the interesting and sinking fund charges, on loans raised by local authorities for approved works, and schemes on a wages basis in which the grants take the form of a percentage of the wages paid to unemployed men taken on for the work. Electricity loan schemes costing £6,904,609 and electricity schemes on a wage basis costing £72,016 have thus been approved for grants. Tramway schemes representing £3,833,344 and £411,100 under the two heads, respectively, have similarly been approved. These apply to local authorities. Electricity undertakings costing £187,600 and tramway and light railway schemes costing £36,026 put forward by public utility companies have also formed the subject of grants.

Accumulator Manufacture in Australia.

By a recent Australian mail we learn that acting on the advice of Capt. H. V. Schofield, export manager of the Chloride Electrical Storage Co., Ltd., a company is to be formed with a capital of £250,000, to establish works for the manufacture of "Exide" accumulators in the Commonwealth.

For Sale.

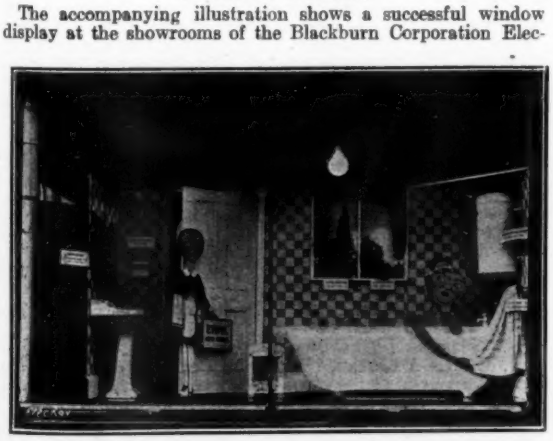
Croydon Corporation Electricity Department has for disposal two B. & W. (12,500 lb.) land type water-tube boilers, oil fired and three B. & W. C.T.M. (14,000 lb.) water-tube boilers with chain-grate stokers. Messrs. Russ & Cree, Glasgow, invite offers for one 250/280 b.h.p. Atlas Diesel Marine oil engine. Messrs. Leopold Farmer & Sons will sell by auction on November 14th, at the London Auction Mart, freehold manufacturing premises at 1-35, Maryland Road, Stratford, E. Glasgow Corporation Tramways Department has for disposal Cummins sanding apparatus, solenoid coils, resistances, motors and controllers. Mr. H. J. Shaw will sell by auction on November 7th, at 13, High Holborn, W.C., electrical and wireless stocks, &c. Messrs. Fuller, Horsey, Sons & Cassell, will sell by auction on November 22nd and following days, electrical plant and wireless apparatus. (See our advertisement pages to-day.)

A Neat Fuse-wire Carrier.

The RAY MANUFACTURING CO., 25, High Street, Wimbledon, S.W.19, has produced an improved model of its "Andy" fuse-wire carrier. This is of vest-pocket size, and contains generous lengths of 5-A and 10-A wire. The case itself is of metal-bound leather. Hints on fuse renewal are contained in a little enclosed folder.

A Bradford Tableau.

The accompanying illustration shows a successful window display at the showrooms of the Blackburn Corporation Electricity Department. The characters depicted are, of course, the well-known Pratt pair, "Tommy Prattkins" and "Ethyl." Whilst they are primarily intended to advertise motor spirit, they admirably serve the purpose to which they have been put in the present instance, as all manner of appliances for use in the bathroom can be displayed to advantage, as will be seen, and the brightness of the show attracts considerable attention from passers-by.



A Window Display at Bradford.

A Prize Window Display.

We have illustrated the windows of the Birmingham showrooms of Messrs. WALKER BROS. on previous occasions, for the firm believes in variety combined with effectiveness. This time we show a special "Ever-Ready" display arranged in connection with a national competition, for which a first prize of £75 was awarded.

Messrs. Walker Bros.' "Ever-Ready" Display.

Book Notices.

"The Wireless Trader Year Book and Diary." London: Trader Publishing Co., Ltd. Price 5s. 6d.—The 1929 edition of this established work of reference has been added to, and its editorial section, trade lists, and buyers' guide have been brought up to date.

"Faraday House Journal." Vol. XIII, No. 1. London: Faraday House College.—The Michaelmas term number of this house organ contains a greater number of articles than usual on various topics.

"Prover med modellturbiner for Morkfoss-Solbergfossanlegget," by Prof. G. Sundby. Pp. 80. Trondhjem: F. Bruns bokhandel. 3.80 kr.

"Science Abstracts" (A & B). Vol. XXXI. Part 10. October 25th, 1928. London: E. & F. N. Spon, Ltd. Price 3s. each.

We have received a copy of the "Dawson Little Red Book," containing over 5,000 annual subscription rates for publications all over the world, from Messrs. Wm. Dawson & Sons, Ltd., Cannon House, Pilgrim Street, London, E.C.

"Television," by A. Dinsdale. Pp. xx+180; figs. 33. London: Television Press, Ltd. Price 5s. net.

Recent Contracts.

The following are among the orders received recently by Messrs. MIRRLEES, BICKERTON & DAY, LTD.:—Barnstaple Corporation electricity works: A 6-cylinder, 450-b.h.p. "Mirrlees-Diesel" oil engine coupled to an Electric Construction Co. dynamo. Sudan Government: Two 6-cylinder, 450-b.h.p. "Mirrlees-Diesel" engines coupled to G.E.C. generators for installation at Port Sudan. Windermere & District Electricity Supply Co.: One 6-cylinder, 300-b.h.p. "Mirrlees-Diesel" engine to drive a generator made by the Electric Construction Co.

The Brown-Boveri organisation has received an order for a 36,000-kW three-cylinder single-shaft turbo-generator, at 3,000 r.p.m., from the N.V. Provinciale Noordbrabant'sche Electriciteits Maatschappij (Holland), for the Geertruidenberg power station. The plant will consist of a turbine and a three-phase alternator generating at 12,000 V, power factor of 0.8, surface condensing plant, distillation and pre-heating plant. The steam conditions will be about 450 lb. per sq. in. gauge at about 750 deg. F.

Visit to "Osram" Lamp Works.

At the invitation of the GENERAL ELECTRIC CO., LTD., several Barnsley members of the Electrical Contractors' Association, accompanied by a contingent from Sheffield, toured the Osram and Robertson Lamp Works, Hammersmith, recently. Mr. F. P. Driver (director of the Osram Works), presiding at luncheon, extended a hearty welcome to those present, while Mr. H. Bray, vice-president of the Barnsley Association, and Councillor Snowden, also of Barnsley, responded for the visitors. Subsequently a visit was paid to the company's showrooms at "Magnet House," and later the party visited the Oxford Corner House for the dual purposes of refreshment, and inspection of the unique system of lighting recently installed there.

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Proposed Co-ordination of the London Traffic System.

The Special Committee under the chairmanship of Sir Oscar Warburg appointed by the London County Council to negotiate with the Underground Group has presented a report in which recommendations for co-ordination are made. Broadly, the proposals are that the L.C.C. tramways shall remain the property of the Council, but their management shall be placed in the hands of a joint body, the interest upon the loan capital to be paid out of a common fund. It is recommended that the agreement should run for a period of 42 years, but before any definite steps can be taken it is necessary for the Council to secure Parliamentary sanction. The object of the proposals is to eliminate overlapping and wasteful competition and they are in accord with the recommendations put forward some time ago by the London and Home Counties Traffic Advisory Committee. The special committee's proposals have the support of the Municipal Reform party, which forms the majority of the Council, but the Progressive and Labour parties appear to be against the scheme. In an interview with a *Daily Telegraph* representative, Mr. Percy Harris, M.P., a Progressive member of the Committee, said that it was a mistake to assume that the tramways were running at a loss, on the basis of company finance. The real results were obscured by the Council's obligation to repay loan capital. "The arrangement now proposed is not a lease, but it will hand over a monopoly of the London traffic to the combine without any direct payment for that monopoly. Parliament should insist that some elected body, responsible to the ratepayers, should have control over fares, routes, and services. An appeal to the Minister of Transport is a quite inadequate safeguard."

The Committee's report was to have been considered by the Council on Tuesday last, but the matter was deferred.

New Electricity Showrooms.

The new central offices and showrooms of the Fulham Borough Council Electricity Department were opened by the Mayor (Ald. W. J. Waldron, J.P.) on October 24th. Councillor Major A. Baggs, chairman of the Electricity and Lighting Committee, presided, and he was supported by members of the Corporation, Sir Andrew Duncan, chairman of the Central Electricity Board, Mr. A. Page, chief engineer to the Board, and Mr. A. J. Fuller, the borough electrical engineer.

The New Fulham Showrooms.

In commencing the proceedings, Major Baggs outlined the history and progress of the undertaking. He said, *inter alia*, that in the last five years the amount of energy sold had risen from 8,686,294 kWh to 16,074,385 kWh, although the revenue had only risen from £114,888 to £126,664. Very favourable charges prevailed, and in addition the use of electricity in the home was fostered by the hiring of apparatus at low quarterly rentals. The scheme covered heaters, cookers, kettles, water heaters, wash boilers and irons. The Mayor was then presented with a golden key, while the Mayoress received a bouquet. After a brief speech the Mayor formally declared the premises open. Sir Andrew Duncan then addressed the gathering. He expressed his admiration of the building and arrangements, and said that he hoped that the Department would have a good complaints department, for it had been said that the success of an electricity supply undertaking was dependent upon the efficiency of its organisation for dealing with complaints. Complaints were sometimes well-founded, but they were often just difficulties due to the consumers' lack of knowledge. Now Fulham had facilities for educating the consumers in the proper use of electricity; the new showrooms would form a useful link between the undertaking and its customers. The proceedings concluded with votes of thanks to the Mayor, Sir Andrew Duncan and all those associated with the construction and equipment of the new premises.

Afterwards the company took tea and then made a tour of inspection of the premises. The main showroom is a spacious apartment tastefully arranged with ample glass showcases and examples of up-to-date lighting fittings. The accounts department, in consonance with the modern idea, is at the rear of this showroom, so that consumers paying their bills have to go through the showroom. In the basement is a large demonstration room in which washing, ironing, cooking, &c., are to be carried on. The offices on the upper floors are very commodious, and the windows provide ample space for the staging of displays.

The building was erected by Messrs. W. J. Marston & Son, and has taken ten months to complete. Covering a floor space of approximately 10,000 square feet, the general building is of brick and steel structure, with reinforced concrete floors. The showrooms are electrically heated throughout and have been fitted with every modern appliance. A special department has been provided for the calibration and testing of meters. The requirements of over 14,000 consumers will be controlled from the general offices by the Commercial Superintendent, Mr. N. A. Chesterfield, and the showroom will be in charge of Mr. W. T. Humphrey. The main staircase is fitted with a handrail of Austrian oak. The total cost of the new showrooms, including site value, is in the neighbourhood of £30,000.

The new Lancaster Corporation electricity showrooms in North Road, which have cost £8,000, were recently opened by the Mayor.

On October 29th the Mayor of Shoreditch formally inaugurated the new municipal electricity showrooms and offices at the corner of Hoxton Street by Old Street. The building, which, with the basement, has four floors, has an imposing frontage, the three principal windows facing Hoxton Street having a total length of 38 ft. with a depth of 10 ft. There are also three smaller windows. Each window is provided with variable spot, colour and flood lighting. The basement is arranged for the general display of lighting fittings and the demonstration of domestic appliances. On this floor there is also an industrial section and the main switchboard for controlling the electricity supply to the building. The ground floor is luxuriously laid out as an entrance hall, with inquiry office, waiting rooms and lounge, the lighting fittings, supplied by the General Electric Co., Ltd., being of lotus flower design. The committee room, chief electrical engineer's office, correspondence offices, and drawing office occupy the first floor, the walls of the committee room and engineer's office being beautifully panelled in walnut. Additional offices for book-keeping, accountancy, and the chief clerk are provided on the second floor. An automatic, electrically-driven, passenger lift has been installed to connect the various floors. The end section of the building has been set aside for stores and large repair shop and the caretaker's apartments. A separate entrance has been provided for goods, and an overhead conveyor has been installed running to a goods lift which connects with the basement, ground and first floors. The building, the cost of which is estimated at £28,654, has been erected by Messrs. R. Schooley and Son to the design of Messrs. Yates, Cook and Darbyshire. The Council has a rental wiring scheme, and since December, 1926, over 5,000 applications have been received. The new showrooms should considerably stimulate the demand for supply under this scheme.

New Catalogues and Lists.

Messrs. Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—Catalogue No. 611, containing very full details and illustrations of the company's radio sets and accessories, together with a pamphlet (No. P.1721) setting forth hire-purchase terms for this apparatus. Also an illustrated and priced folder dealing with the "Ideal" iron.

Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—"The Crabtree," Vol. 1, No. 6, containing advice "To the Young and Ambitious," and notes on Home Office lampholders and other matters.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A booklet, illustrated in colours, containing the series of advertisements which have appeared under the general heading "It Took Many Men to Build One 'Isco' Cut-Out." The advertisements have also been reproduced in a series of "cigarette" cards, one of which is enclosed with each cut-out.

The S.A.M. Pump Co., 39, Victoria Street, S.W.1.—Catalogue No. 2, containing illustrated details and prices of "Spirovane" rotary and "Autoprime" high-vacuum centrifugal pumps.

Messrs. Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—A booklet containing illustrated particulars and prices of the company's switch-fuses, distribution panels, watertight plugs, &c.

ALLIANCE WHOLESALE, LTD., 62, Great Russell Street, W.C.1. —A very complete catalogue of electrical supplies of all kinds, including wiring materials and accessories, lamps, lighting fittings, switch- and fuse-gear, motors, generators, tools, &c. Illustrated and priced.

NEWTONS OF TAUNTON, 6, Grape Street, Shaftesbury Avenue, W.C.2.—A thumb-indexed catalogue of the company's d.c. motors and generators, with full technical details, illustrations, and dimensions.

The B.E.N. PATENTS, LTD., 92, Tottenham Court Road, W.1. —An illustrated and priced leaflet, describing the company's combination portable paint spray and tire inflation unit.

The RUNBAKEN MAGNETO CO., Tipping Street, Ardwick, Manchester.—Leaflets illustrating and describing a "Resonant Circuit" ignition tester, the "Get-You-Home" emergency carlighting set, and the "Warnolite" combined tail lamp and buzzer. Priced.

CRYSELCO, LTD., Kempston Works, Bedford.—A coloured cardboard cut-out (Col. Chris. Elco) advertising the company's lamps.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Further "Osram" lighting installations are illustrated and described in the October "Osram-G.E.C. Bulletin," including that in Truro Cathedral. In addition there are many notes on the company's radio and domestic apparatus. Also Publication No. I.E. 4843, dealing with the subject of industrial illumination, with pictures of actual installations carried out with the company's fittings, and Folder O.S. 4759, advertising its automobile lamps.

MESSRS. WILLIAM GEIPEL, LTD., 156-170, Bermondsey Street, S.E.1.—A priced and illustrated leaflet dealing with the "Rapper" hand-operated hammer-drill.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, Westminster, S.W.1.—A set of index cards has been produced for use in the company's catalogue binder. Each class of time switch is provided for.

THE ELECTRIC FURNACE CO., LTD., 17, Victoria Street, S.W.1. —A pamphlet illustrating a number of electric furnace installations carried out by the company, with some general notes on the use of electricity in this connection, particular reference being made to the furnaces supplied by the company.

MESSRS. HOPKINSONS, LTD., Huddersfield.—List No. 2180, containing illustrations and dimensions of various kinds of "Mac" steam valves.

THE SUN ELECTRICAL CO., LTD., 118 & 120, Charing Cross Road, W.C.2.—The company's 1928-29 catalogue of radio receivers, components and accessories is again a very comprehensive one. It has 176 pages, containing illustrations, brief details and prices of all makes of apparatus.

METROPOLITAN-VICKERS AUSTRALIA PTY., LTD., Auburn (N.S.W.) and South Melbourne (Vic.).—Illustrated leaflets advertising the company's Australian-made switchgear, traction equipment, &c.

THE MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon, N.W.9.—A series of illustrated pamphlets dealing with the company's portable blower, commutator stones and mica undercutters, and the "Wigginton" voltage tester.

Local Exhibitions.

LINCOLN.—The Mayor of Lincoln opened an electrical exhibition at the Drill Hall on October 20th in celebration of the 30 years of progress of the Corporation Electricity Department. The supply of electricity for domestic uses in Lincoln has increased during the past ten years from 2¼ million to nearly 20 million kWh. Twenty-eight exhibitors took part in the display. In the entrance hall a shop window was arranged, equipped by the British Thomson-Houston Co., Ltd., and furnished by a local firm. Lectures were delivered each day by prominent men in the electrical world, whilst cooking demonstrations were given each evening. In the centre of the hall there was a stand fitted up as the interior of the average-sized house, with four rooms, all furnished by Messrs. Mawer & Collingham, Ltd., and electrically equipped by several firms. The bathroom illumination and electrical appliances were supplied by Siemens Electric Lamps & Supplies, Ltd., and the hot water storage system was made by the Jackson Electric Stove Co., Ltd. The drawing-room was electrically equipped by Metro-Vick Supplies, Ltd. The dining-room lighting and electrical appliances were by Messrs. L. G. Hawkins and Co., Ltd. The bedroom electrical equipment was supplied by Siemens Electric Lamps & Supplies, Ltd. The stand of the General Electric Co., Ltd., bore examples of labour-saving devices of all kinds. The exhibit of the Jackson Electric Stove Co., Ltd., included a range of domestic electric cookers, electric water heaters, fires, &c.

The Lincoln Branch of the Electrical Contractors' Association arranged a display of ornamental and useful fittings and apparatus for domestic and industrial purposes. Electrolux, Ltd., London, exhibited cleaners, refrigerators, water softeners and floor polishers and demonstrated them. There was an electrically-equipped café and several interesting electric lighting demonstration models. Other exhibitors were Burnley Components, Ltd., Electrical Appliances, Ltd., the Revo Electric Co., Ltd., Credenda Conduits Co., Ltd., the Hotpoint Electric Appliance Co., Ltd., Dakol Electric, Ltd., Z Electric Lamps & Supplies Co., Ltd., and Berry's Electric, Ltd. The exhibition undoubtedly made a successful appeal to householders and tradespeople alike; arrangements were made with the education authority whereby some three thousand school children visited the exhibition. The arrangements were supervised by Mr. G. Hunter, showroom sales and publicity superintendent of the department.

CROWBOROUGH.—At the electrical exhibition mentioned in our last issue the exhibitors included Berry's Electric (1928), Ltd., Messrs. Belling & Co., Ltd., the Credenda Conduits Co., Ltd., Metro-Vick Supplies, Ltd., and the General Electric Co., Ltd. The G.E.C. display included an all-electric house and created a good deal of interest. At the conclusion of the exhibition the demonstrators and staff were entertained to supper and a dance, arranged by the Weald Electricity Supply Co., Ltd. In the unavoidable absence of Major C. B. Grace (engineer and manager), Mr. P. G. Hobbs (district manager) presided.

WATFORD.—The Watford Tradesmen's Association concluded on Saturday last a shopping week festival in which the Electricity Department played a prominent part by holding an electrical exhibition, and providing electricity free of charge for special illuminations in the town. The "Elms"—formerly a private hotel, and now the property of the Corporation—was converted for the purpose of the exhibition, and four rooms on the ground floor were allotted for this purpose. Three rooms were given over to the Metro-Vick Supplies, Ltd., the General Electric Co., Ltd., and the Hotpoint Appliance Co., Ltd., respectively, the fourth room being used by the Electricity Department as an inquiry bureau to supply consumers with information as to electricity charges, &c. The Metro-Vick Supplies, Ltd., had a well-arranged and varied display of "Cosmos" domestic appliances, including violet-ray apparatus; the General Electric Co., Ltd., showed a wide range of "Magnet" cookers, heaters, lighting fittings, &c., and the Hotpoint Electric Appliance Co., besides displaying suction cleaners, irons, &c., gave electric cooking demonstrations. The domestic atmosphere of the exhibition was very noticeable, and prospective customers were able to see the appliances working in their natural surroundings. The "Norwich" system of charging of ½d. per kWh, plus a fixed charge of 15 per cent. of the ratable value of premises, which has been introduced by the Corporation, is an added inducement to consumers to use domestic appliances. The exhibition aroused considerable interest, the attendance averaging about 3,000 visitors per day, and the applications for appliances were good. The Corporation has arranged for all appliances purchased to be supplied through local contractors.

BIRKENHEAD.—In the Home and Industry Exhibition now being held, electrical apparatus is being shown by the Birkenhead Corporation Electricity Department, Messrs. Robb Bros., and the Economic Electric Co., Ltd. There is on view a comprehensive range of electrical domestic appliances displayed in a manner to show their relationship to the general scheme of decorations and furnishings.

Bankruptcy Proceedings.

NATHAN JAWETT, electric lamp dealer, late of 58, Bedford Street, E.—This debtor attended before Mr. Registrar Francke at the London Bankruptcy Court on October 19th for public examination. The receiving order was made on the petition of the British Thomson-Houston Co., Ltd., who claimed £68, taxed costs of an infringement action decided against the debtor. That is practically the only liability, and the assets consist of book debts, £128. The debtor refused to state where he obtained the lamps which he sold; his Honour therefore adjourned the examination for one week and reported the refusal to Mr. Justice Astbury on October 22nd. Mr. Tindale Davis appeared before his Lordship on behalf of the petitioning creditors, and Mr. Gallop represented the debtor, who was unable to be present through illness. After hearing counsel on both sides, his Lordship, giving judgment, said that the bankrupt was carrying on an illicit business in infringing lamps. That particular business had assumed large proportions in this country during the last two or three years, and the Court was constantly being asked to restrain infringements of two patents belonging to the petitioning creditors. Apparently he was still dealing in infringing lamps. The circumstances in which he obtained the money to pay for them, and the relationship between him and the person or persons from whom he obtained the lamps were very relevant to the bankruptcy. Apparently he did not pay for them in cash, but he might have some arrangement with the importers to supply him by way of commission, or remuneration, or otherwise. In his Lordship's opinion the debtor should be forced to answer the question; a large trade might be done which would involve innocent persons in serious consequences, and he thought it was to the public interest that the debtor should be compelled to make a full and proper disclosure of the character and nature of the business which he had carried on before he was made a bankrupt. If the debtor did not enter an appeal or attend the Court on October 26th to answer the question, an order to commit him for contempt of court would become effective.

The debtor again attended on October 26th for public examination before Mr. Francke, and was questioned at

some length regarding the source from which he obtained the infringing lamps. Eventually his public examination was further adjourned till December 7th.

E. W. BLAIR, Hampstead Garden Suburb, electrical engineer and contractor, lately trading as Blair & Son, Hendon.—The first meeting of creditors was held on October 19th, at 29, Russell Square, W.C.1, when the matter was left in the hands of the Official Receiver as trustee of the estate. The statement of affairs showed liabilities of £265, against assets of £77, leaving a deficiency of £188. Debtor attributed his failure to losses on contracts through under-estimating, through work being rejected by the local council, and household and personal expenses. He commenced business in August, 1924, without capital, but in September of that year he received £200, which he put into the business. From November, 1924, to April, 1926, he entered into contracts to carry out the electrical installations and to supply all necessary material for about 160 houses at Beckenham, on which he estimates he lost about £150. In April, 1926, debtor entered into a similar contract for installations in 14 other houses on the same estate, and in order to avoid loss he used a cheaper quality of cable, but on completion of the contract the local council refused to pass the work, and he lost about £100. In January, 1927, he rented a shop at Hendon, but in May, 1928, his stock was sold by the landlord under a distraint for rent. the only book of account produced was a debtors' ledger. The debtor stated that he became aware of his position in January, 1926. The following are creditors:—

	£		£
Markers, Ward & Co., Ltd.	32	Wenham Lighting Corporation	33
Neville Hines & Co., Ltd.	25	Wholesale Electric Lamp Co.	76
Sun Electrical Co., Ltd. ...	40		

R. J. JACOBS, wholesale dealer in wireless accessories, late of 30d, Great Sutton Street, E.C.—An application was made last week to Mr. Registrar Francke at the London Bankruptcy Court for an order of discharge on behalf of this bankrupt, who failed in December, 1926. The Official Receiver reported that he estimated the unsecured indebtedness at £8,549, and the assets valued by the debtor at £35 had realised that sum. No dividend had been or could be paid. In June, 1907, the debtor began business in partnership with another person as factors of electrical accessories. In 1915 they sold the business to W. A. & R. J. Jacobs, Ltd., of which the debtor acted as joint managing director latterly at a remuneration of £1,500 a year until the voluntary liquidation of the company in September, 1920. He afterwards carried on business as a metal stamper and later as a wholesale dealer in wireless accessories. The business he carried on until April, 1924, and he afterwards acted as managing director of Brijane, Ltd., until October, 1926. The debtor attributed his insolvency to the failure of W. A. & R. J. Jacobs, Ltd., and to his liability under a guarantee given by him on its behalf. The discharge was suspended for two years on statutory grounds.

LOUIS SAMUEL, wireless accessories merchant, 65, High Street, Camden Town.—A meeting of the creditors was held recently at the London Bankruptcy Court to elect a trustee in the place of Mr. Wm. Rowley, who was removed from that position by the Board of Trade last May. The debtor failed in September, 1927, with liabilities of £1,875, against assets valued at £1,500. Mr. D. Williams, Official Receiver, reported that he had received proxies for the appointment to the post of Mr. J. T. Morgan, 4, New Court, Lincoln's Inn, W.C. Mr. F. W. Baker, who was supported by other creditors, opposed the election of Mr. Morgan on the ground that he was an accounting party to the estate, he having acted as receiver of Delport, Ltd., under a debenture granted to the debtor and claimed by Mr. Rowley as part of the debtor's estate. Delports, Ltd., was the company to which the debtor transferred his assets. Mr. Morgan was, however, finally appointed, but the Official Receiver took a note of the objection put forward by Mr. Baker, who intimated that he intended to report the whole circumstances to the Board of Trade.

G. L. HARVEY, 255, Hurcott Road, Kidderminster, Worcestershire, electrical engineer.—The receiving order herein was made on September 29th, on the debtor's own petition. According to the statement of affairs there are liabilities of £269 and assets of £2, leaving a deficiency of £267. After twenty years' experience as an electrical engineer, debtor commenced trading on his own account in April, 1926, with a capital of £20. In September of the same year he bought a taxi-cab in order to augment his income. Loss of trade through an accident and a decrease in his electrical trade were the reasons for his failure.

F. J. WELBERRY, Skegness, Lincs., electrician.—The public examination herein was held on October 18th at Boston, when the matter was closed. Debtor stated that he commenced trading on his own account shortly after 1920 with a capital of £23, his savings. He had no business premises, and went to Boston in December, 1926.

M. WOOLRIDGE (Woolridge Radio Co.), 26 & 29, Lisle Street, W.C.—Receiving order made October 18th, on a creditor's petition. First meeting held October 31st. Public examination, December 11th, both at Carey Street, W.C.

H. C. SHARPE, wireless engineer, 42, Molesworth Street, Wadebridge.—Receiving order made October 19th, on a creditor's petition.

C. J. MEREDITH, electrician, lately trading at the rear of Princes Road, Torquay.—Receiving order made October 17th, on debtor's own petition. First meeting, November 2nd, at the Official Receiver's offices, Exeter Bank Chambers, 67, High Street, Exeter; public examination, November 14th, at the Castle, Exeter.

P. CALLAND, electrician, The Cross, Bromborough, Chester.—Trustee, Mr. E. D. Symond, Government Buildings, Victoria Street, Liverpool, released October 15th.

G. COHEN, electrical engineer, 49, Newman Street, W.—Receiving order made July 31st, on a creditor's petition. First meeting, Nocember 2nd. Public examination, December 5th, both at Carey Street, W.C.

A. C. COOPER, electrical engineer, 1a, Sherwood Street, Scarborough.—Last day for proofs for dividend, November 10th. Trustee, Mr. D. S. Mackay, Official Receiver, 14, Figtree Lane, Sheffield.

W. T. LACEY, electrical engineer, 10, George Street, Bath.—Last day for proofs for dividend, November 9th. Trustee, Mr. H. Ashton, Official Receiver, 26, Baldwin Street, Bristol.

T. S. SOUTHWOOD, electrical engineer, Pound Farm, Whyke Road, Chichester.—Receiving order made October 24th on debtor's own petition.

H. V. CHARLEY (Dinas Powis Electrical Supply Co.), electrical engineer, 31, Greenfield Avenue, Dinas Powis.—Receiving order made October 18th on a creditor's petition.

A. ANGERS (A. Angers & Co.), electrical engineer, 19, Bristol Road, Wavertree, Liverpool.—Receiving order made October 24th on a creditor's petition.

Company Liquidation.

KINGSMILL ART METAL & ELECTRICAL CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. H. Dunn, 57, Lodge Road, Croydon. A meeting of creditors was called for November 1st.

Shipping an "English Electric" Locomotive.

We reproduce herewith a photograph of a 50-ton electric locomotive built by the ENGLISH ELECTRIC CO., LTD., for the

An "English Electric" Locomotive for New Zealand.

New Zealand Ministry of Railways, being loaded on to the liner *Cumberland* at Birkenhead recently. Owing to its length the locomotive had to be slung at an angle of 45 deg. to enable it to pass into the hatch.

Trade Announcements.

COPES REGULATORS, LTD., Thanet House, 231, Strand, W.C.2, has recently been formed to handle the manufacture and sale of Copes boiler feed water regulators. Messrs. JAMES GORDON

AND CO., LTD., the former licensees, will continue their activities as combustion engineers with their other specialities, at the same time having a shareholders' interest in the new company. The directors of Coles Regulators, Ltd., are Mr. H. W. Spencer (Liptak Furnace Arches, Ltd.), Mr. C. H. Armstrong (recently with Messrs. James Gordon & Co.), Mr. E. W. Nick (Northern Equipment Co., U.S.A.), and Mr. Neil H. Brown (late of the Northern Equipment Co.).

The London showroom of Messrs. BEST & LLOYD, LTD., has been removed to new premises at 40, Great Marlborough Street, W.1.

Mr. E. A. INGOLD, electrical factor, 169, Park Lane, Leeds, announces that he has disposed of his interests in the "Climax Electrics" to Mr. L. BRIDGEWOOD, who will in future trade as a wholesale factor at that address. Mr. Bridgewood asks for copies of trade lists.

Messrs. JOHN CAWLEY & Co., 53, Victoria Street, S.W.1, have been appointed sole agents for London for Messrs. J. P. Hall and Co., Ltd., Oldham, as from November 1st.

Messrs. ROBERT YUILLE & SONS, LTD., electrical engineers, Kilmarnock, have removed their offices and stores to 4 and 6, East George Street, and have opened new showroom premises.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Oct. 30th.	Fortnight's inc or dec.
a	Acid, Oxalic	per lb.	5½d.	...
a	Ammoniac, Sal	per ton.	£60	...
a	Ammonia, Muriate (large crystal)	,,	£52	...
a	Bisulphide of Carbon	,,	...	...
a	Borax	,,	£35	...
a	Copper Sulphate	,,	£35 10s.	...
a	Potash, Chlorate	per lb.	8½d. to 4d.	...
a	,, Perchlorate	,,	5½d.	...
a	Shellac	per cwt.	£18 10s.	...
a	Sulphur, Commercial	,,	£11	...
a	,, Roll	,,	£11	...
a	Soda, Chlorate	per lb.	8d.	...
a	,, Crystals	per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ...	per lb.	8½d.	...
	METALS, &c.			
b	Aluminium, Ingots	per ton.	£95 to £100	...
b	,, Wire	per lb.	1/8 to 1/9	...
b	,, Sheet	,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—			
	Grade I	per ton net.	£202	£2 inc.
	Grade II	,, ,,	£141	£1 inc.
	Grade III	,, ,,	£76	...
c	Brass (rolled metal 3" to 12" basis)	per lb.	9¼d.	...
c	,, Tubes (solid drawn)	,,	1/- to /0½d.	...
c	,, Wire, basis	,,	10½d.	...
c	Copper Tubes (solid drawn) ...	,,	1/1½	...
c	,, Bars (best selected) ...	per ton.	£98	¼d. inc.
c	,, Sheet	,,	£98	£2 inc.
c	,, Rod	,,	£98	£2 inc.
d	,, (Electrolytic) Bars ...	,,	£74 5s.	5/- inc.
d	,, Sheets	,,	£148 10s.	...
d	,, ,, Wire Rods		£94 5s.	50/- inc.
d	,, ,, H.C. Wire	per lb.	1 ¼d.	¼d. inc.
f	Ebonite Rod	,,	2/8 to 2/6	...
f	,, Sheet	,,	2/8 to 2/6	...
n	German Silver Wire	,,	2/3	...
h	Gutta-percha, fine	,,	nom.	...
h	India-rubber, Para fine	,,	11d.	¼d. inc.
i	Iron Pig (Cleveland No. 3.) ...	per ton.	65/-	...
i	,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g	Lead, English pig	,,	£23 17s.	...
g	Mercury	per bot.	£23 to £23 5s.	...
e	Mica (in original cases) small ...	per lb.	8d. to 8/-	...
e	,, ,, medium	,,	4/- to 8/-	...
e	,, ,, large ...	,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings	,,	1/9½	...
p	,, ,, drawn bars & rods	,,	1/8	...
p	,, ,, rolled strip & sheet	,,	1/9½	...
p	,, ,, wire...	,,	1/4	...
e	Platinum	per oz.	£17	...
d	Silicium Bronze Wire	per lb.	1/1½d.	½d. inc.
r	Steel, Magnet, in bars	,,	7½d.	...
n	Tin, Block (English)	per ton.	£225 15s. to £226	£6 to £6 5/- inc.
n	,, Wire, Nos. 1 to 18	per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their report, dated October 27th, Messrs. James Forster and Co. stated that the lead market had had another week of dull and uninteresting conditions, the price scarcely varying from day to day. Lead for early arrival continued to be scarce, and any arriving was readily absorbed. Consumption remained steady, but it could not be said that any increase was apparent. "With more normal conditions in shipping from Australian ports and a very quiet demand on the Continent, it seems more than likely that arrivals will be larger next month and fairly full in December, but the general position of the metal is pretty sound, and we do not anticipate any serious setback in values, though at the moment there is nothing in sight to justify any material advance."

Lighting and Power Notes.

Apsley Guise.—INAUGURATION OF SUPPLY.—An electric lighting scheme has been completed, the supply being obtained from the Bedford Corporation works, and electricity was switched on on October 11th by the chairman of the Parish Council. Electricity has been adopted for street lighting.

Barrow-in-Furness.—ASSISTED WIRING SCHEME.—The Town Council has authorised the electrical engineer to make a full report on the question of the Corporation's undertaking the wiring of premises on the deferred payment system.

It is proposed to construct an overhead line to Grange-over-Sands and Meathop, but as the Ulverston Rural District Council has made representations to the Ministry of Transport on the matter, an inquiry will be necessary before the Electricity Commissioners grant the Order.

Bedwas and Machen.—ELECTRICITY SCHEME DELAY.—The Urban District Council has received a communication from the Electricity Commissioners regarding its application for sanction to a loan of £11,195 for extensions to its electricity undertaking. The Commissioners state that the Council does not appear to have obtained the sanction of the Minister of Transport to the erection of overhead lines, and until this is received they cannot sanction the loan.

Boston.—INQUIRY.—On October 26th, at the County Hall, Boston, Mr. F. Gordon Tucker, O.B.E., T.D., held an inquiry on behalf of the Minister of Transport into the application of the Boston and District Electric Supply Co., Ltd., for compulsory wayleaves over certain lands in connection with the Boston-Holbeach transmission line. As the result of negotiations, some of the difficulties were removed, but four poles over a 73-acre steam-cultivated field remained in dispute. It was contended that a long span or an underground cable should be adopted, but no definite agreement was reached. The Inspector stated that he would make a report to the Minister.

Birkenhead.—ELECTRICITY IN BULK.—The Town Council has received the approval of the Electricity Commissioners to an agreement with Wallasey for an increased supply of electricity in bulk, and also for main transmission lines to be established.

Blymhill.—ELECTRICITY SUPPLY.—At a recent meeting of the Rural District Council, Mr. Morton, a representative of the West Midland Joint Electricity Authority, attended, and said that provided the replies to a questionnaire now being distributed in the district were satisfactory, there was every probability of a supply of electricity being brought into the district within the next 15 or 18 months. He added that the wiring of premises would be undertaken by the authority, and the cost paid on the hire-purchase system or otherwise. The price of electricity for lighting would probably be 6d. per kWh.

Bradford.—NEW TRANSFORMER CHAMBER.—The Corporation Electricity Committee has authorised the provision and equipment of a transformer chamber in Dickworth Lane at a cost of £5,590.

Brighton.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee has decided to install a new 1,500-kW motor convertor at an estimated cost of £10,500, to erect a substation at Patcham at a cost of £6,000, and to increase the feeders in the vicinity of the Aquarium at a cost of £2,750.

LOAN.—Application is to be made for sanction to a loan of £8,267 for lighting improvements in London, Dyke, and Lewes Roads.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The first of the four 20,000-h.p. units being constructed at the hydro-electric power plant at Grand Falls, on the Saint John River, was put into operation on October 1st. The new plant is the largest hydro-electric development in the Maritime Provinces, and it has the largest water pressure tunnel in Canada, this being 2,755 ft. long and 24¼ ft. in diameter. The power developed will be utilised to operate the new pulp and paper mills being constructed or enlarged in northern New Brunswick. Designed for four generators of 20,000 h.p. each, the power house is to have an initial installation of three units, and will be operated by the Saint John River Power Company, a subsidiary of the Canadian International Paper Company.

The Fraser Companies, Ltd., have contracted to use 20,000 h.p. from the Grand Falls plant for the operation of their mills at Edmundston and for a new bleached sulphite pulp mill to be erected at Athol, near Campbellton, on Chaleur Bay, which can be served by the same transmission line which will carry power from Grand Falls to the Dalhousie mill of the International Paper Company. The Fraser Companies' expansion plans also include a proposed new pulp mill on the Miramichi River. Transmission lines from Grand Falls to Edmundston have already been completed and surveys for the line from Grand Falls to Dalhousie have been completed over 80 miles of the 125 miles to be traversed. The transmission line to Dalhousie will convey from 30,000 to 40,000 h.p. at a pressure of about 132,000 V.

Cheltenham.—CHANGE-OVER.—The Corporation Electricity Committee has obtained sanction to a change of the system of supply and is to apply for sanction to a loan of £37,500 for the requisite plant.

Continental.—BELGIUM.—The Compagnie Auxiliaire d'Electricité, in order to meet the increasing demand for electricity supply in the Peruwelz and Antoing districts, is installing new plant at its Antoing station, which will practically form a new generating station. The boilers will be adapted for pulverised fuel firing and work at a pressure of 50 atmospheres, and the turbines will be of the latest high-pressure type.

The industrial and economic restoration of Belgium has been particularly evident in the electrical industry. Whereas, 1,650,000,000 kWh was generated by the various concerns in 1923, 2,274,000,000 kWh was generated in 1925, and over 3,000,000,000 kWh in 1927. As regards the consumption *per capita* of the electric energy produced, not only by the distributing organisations, but also by the industries generating their own electricity, the figures published on December 31st, 1927—the latest available—put Belgium sixth on the list with 320 kWh, being preceded by Switzerland (700 kWh), the United States (520), Canada (612), Norway (493), and Sweden (364), and followed by Germany (250), France (248), Great Britain (200), Italy (197), Holland (124), Japan (88), and Czecho-Slovakia (25).—*Reuter's Trade Service* (Brussels).

Good progress is being made by the Société d'Electricité de la Region de Malmedy with the erection of the hydro-electric station at La Marche, and it is expected that the plant will be ready for operation by the end of the current year.

RUMANIA.—Under the auspices of the Société Financière d'Exploitations Hydro-Electriques (" Hydrofina "), of Brussels, a new company, to be known as the Société Jalomita, is being formed to establish a large new hydro-electric plant on the River Jalomita, near Moreni, Rumania. As a commencement a 15,000-h.p. station is to be established, the contract for the work being in the hands of the Compagnie d'Entreprises Electro-Mécapiques, Paris, and the Brown-Boveri Co. The station will be connected with Bucharest by a 78-mile h.p. transmission line. Later a second plant of 10,000 h.p. is to be constructed.

GERMANY.—The hollow-cable transmission line erected in 1926 by the Rheinisch-Westfalischen Electricitäts-Werk Gesellschaft between Cologne and Rheinau near Mannheim, is shortly to be extended to the Vorarlberg district. The line is designed to transmit power at 220,000 V, but has so far been used only up to 110,000 V; when, however, the extension is completed, power is to be transmitted at the maximum pressure. The contract for the equipment of seven 220/110-kV transformer stations to be erected in connection with the extended line, has been placed with the Siemens-Schuckertwerke, of Berlin.

Edinburgh.—YEAR'S WORKING.—We have received from Mr. E. Seddon, engineer and manager of the Corporation electricity undertaking, a copy of his report, together with the accounts, for the year ended May 15th last. The total revenue amounted to £556,887, and working expenses were £312,583, leaving a gross profit of £244,304. The figures for the preceding year were:—Income, £584,177; working expenses, £380,107; gross profit, £204,070. Capital charges absorbed £227,933, and there was a net surplus of £16,371, as compared with a deficit of £15,028 in the preceding year. The capital expenditure during the year amounted to £278,586, and included £83,299 for lands and buildings, and £69,623 for machinery and plant at Portobello station, and £105,487 for mains and cables, including transformers. The total now spent on the undertaking now stands at £4,032,838. The sales of electrical energy increased from 91,484,739 to 101,597,659 kWh, and the maximum load from 43,277 to 48,403 kW. The new turbine and switchrooms at Portobello station were sufficiently advanced for a commencement to be made with the erection of plant, and the first of the two 25,000-kW sets is expected to be in commission this autumn. Owing to the delays which have occurred in the erection of the boiler-house steelwork, the new boiler plant will not be ready for next winter's load, but it is expected that the four boilers constituting the third boiler room will be ready for service by the spring of 1929. The second 25,000-kW set, together with the fourth boiler room, will not be ready for service until the winter of 1929-30. Twelve new static substations were put into commission during the year under review.

Ilford.—LOAN.—The Corporation Electricity Committee has made application for sanction to a loan of £50,000 for mains and services.

Isle of Man.—ELECTRICITY SCHEME.—The *Daily Dispatch* reports that Mr. Bertram Kelly, borough electrical engineer of Douglas Corporation, recently announced in an address to the Douglas Dilettantes' Debating Society that the General Electric Co., Ltd., has decided to apply immediately for distributing powers over the whole of the Isle of Man, excluding the Douglas area, buying electricity in bulk from Douglas Corporation. The Corporation had quoted a fixed charge plus 1d. per kWh for a bulk supply, which would make it possible to supply electricity to consumers at a price which would compare favourably with those charged in small places in other parts of the British Isles.

London.—STEPNEY.—*Year's Working.*—The report of the borough electrical engineer (Mr. W. C. P. Tapper) on the working of the electricity undertaking for the year ended March 31st last shows a total income of £324,377, and working expenses of £159,058, leaving a gross profit of £165,319. The figures for the preceding year were: Income, £306,080; working expenses, £192,555; gross profit, £113,526. To the gross profit was added revenue from other sources, making a total of £167,328 available, and after payment of capital and other charges there was a net surplus of £27,526, as compared with a deficit of £3,824 in the preceding year. The capital expenditure during the year amounted to £198,151, and included £65,458 for machinery and £78,683 for mains. The sales of electrical energy increased from 48,063,651 to 55,421,173 kWh, and the maximum supply demanded from 26,400 to 29,750 kW. The average price obtained per kWh fell from 1,489d. to 1.360d. Contracts were placed during the year for the construction of buildings and installation of plant in connection with the 20,000-kW extension authorised in the previous year.

POPLAR.—The Borough Council has received the consent of the Electricity Commissioners to the installation of one 15,000-kW, 3-phase, 50-cycle turbo-alternator, and three 75,000-lb. boilers at the electricity works.

Louth.—SPECIAL ORDER.—The Special Order, made by the Electricity Commissioners authorising the Corporation to supply electricity in the borough and parts of Lindsay, has now been confirmed by the Minister of Transport.

Nairn.—ELECTRICITY SCHEME.—The Town Council has accepted the offer of Messrs. Johnson & Phillips, Ltd., to install electric lighting in the town without any liability to the Council. The price agreed upon for the supply is 8d. per kWh for lighting and 4d. per kWh for power, and the Council is given the option of purchasing the plant after seven, fourteen, or twenty-one years. The scheme, it is expected, will be proceeded with immediately.

North-West England Scheme.—Commenting on the North-West England and North Wales Electricity Scheme adopted by the Central Electricity Board, Councillor E. A. Heaney, chairman of Preston Electricity Committee and vice-chairman of the Mid-Lancashire Electricity Board, stated on October 25th that it should prove a great boon to industry. The demands under the new scheme would eventually mean the erection of a new super station on the Ribble, near the present one, equipped with two 50,000-kW sets which, with the present station's 60,000-kW, would make a total output of 160,000 kW. The present station was designed to contain four sets, three of which have been installed, and the fourth is about to be put in.

Portsmouth.—ELECTRICITY SUPPLY.—The Corporation is now giving a supply of electricity to Bognor, through Chichester. A further extension of mains is contemplated to Rowlands Castle, the estimated cost being £8,000, and it is anticipated that a revenue of about £1,400 will result. Application is being made for sanction to the necessary loan. Sub-stations are also to be erected at Copnor Road, Dover Road, Cowplain, and Horndean, the estimated cost of the land and buildings being £2,195.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

KEIGHLEY.—Lighting: Flat rate of 4½d. per kWh. Heating, cooking, and other domestic purposes: Flat rate of 1d. per kWh.

CHATHAM, ROCHESTER AND DISTRICT.—*Kent Electric Power Co.*—Lighting, 6½d. per kWh. Power, heating and cooking: 2d. per kWh.

FULHAM.—Lighting: From 4d. to 3½d. per kWh. Power, heating and cooking: From 1d. to ½d. per kWh. Combined tariff: The " unit " charge reduced from 1d. to ½d. per kWh.

Romsey (Hants.).—INAUGURATION OF SUPPLY.—An electricity supply provided by the West Hampshire Electricity Co., Ltd., was to be formally inaugurated on November 1st, and the ceremony was to be followed by a three-days' electrical exhibition.

Rothesay.—NEW PLANT.—*Correction.*—In a note bearing this heading in our issue of October 19th (p. 685) we stated that the Town Council had agreed to purchase a 300-h.p. generating set. The size of the set in question is actually 300 kW, the engine rating being 466 h.p.

Seaton (Devon).—INAUGURATION OF NEW PLANT.—A new 135-h.p. Petter engine and generator were formally started at the electricity works of the Seaton and District Electric Light Co., Ltd., by the chairman of the company on October 20th. It is anticipated that the additional plant will meet the demands for electricity during the next five years. The company's engineer is Mr. P. O. Wittey.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Brighton Corporation to supply electricity in the parish of Telscombe; Tunbridge Wells Corporation to supply electricity in the rural districts of Tonbridge and Sevenoaks, and part of the rural districts of Uckfield and East Grinstead; and the transfer of the Hindhead and District Electric Light Co., Ltd., to the Aldershot Gas, Water and District Lighting Co.

Stoke-on-Trent. — NEW SUB-STATIONS.—The Corporation Electricity Committee is to equip sub-stations at Stoke railway station at a cost of £1,750 in order to give a supply to the L.M.S., and at Porthill at a cost of £2,100.

SUPPLY TO HOUSING ESTATE.—The Committee is to provide a supply of electricity to the Cornhill housing estate at a cost of £2,600.

United States.—ELECTRICAL DEVELOPMENT.—New high records in output are announced by the North American Company, America's largest producer of electrical energy, for the first three quarters of 1928. Output for the third quarter was 1,572,800,000 kWh, an increase of 16.5 per cent. over the same period last year. The total output for the nine months was 4,405,000,000 kWh, an increase of 14.5 per cent. over the corresponding period of 1927. According to the president of the company, this steady increase in the use of electricity may be taken as a close gauge of general industrial prosperity throughout the United States, inasmuch as it represents the energy supplied by the same group of companies during 1928 and 1927 to more than 1,000,000 customers, including widely diversified industries, in California, Missouri, Illinois, Iowa, Ohio, Wisconsin, Michigan, and the District of Columbia.

Workington.—YEAR'S WORKING.—In the second year of the existence of the municipal electricity undertaking there was a net profit of £1,278.

Tramway and Railway Notes.

Australia.—MELBOURNE.—We have received from the Melbourne and Metropolitan Tramways Board (engineer, Mr. T. P. Strickland; manager, Mr. A. D. Murdoch), a copy of the report, together with the statement of accounts for the year ended June 30th last. The total income from the electric tramways amounted to £1,602,068, as compared with £1,429,014 in the preceding year. Operating expenses were £1,057,066, as against £963,557, leaving a gross profit of £545,002 (£465,457), which was carried to net revenue account, together with a gross profit of £235,739 from the cable tramways, and a deficit from the motor-omnibus system of £9,608, making a total of £771,133 available. Capital and other charges absorbed £325,955, and there was a net surplus of £445,178, as compared with £429,390 in 1926-27. The Board's expenditure upon the construction and reconstruction of tramways, conversion of cable tramways to electric traction, erection of buildings, construction of rolling stock, purchase of lands, and sub-station equipment, &c., during the year, amounted to £823,715. The number of passengers carried on the electric system increased from 118,858,967 to 132,805,672, and the car miles run from 13,387,869 to 15,215,696. The conversion of the Richmond cable tramway to electric traction was completed during the year, but the Board decided, in view of the pending deficit in the current year's operations and the continuance of the industrial depression, to postpone the conversion of other cable tramways until the end of this year. The cost of the conversion of other routes is estimated at £1,000,000, the interest and sinking fund upon which would represent an annual charge of at least £70,000. Over three miles of new route was opened during the year under review, and approximately 10 miles of single track reconstructed.

Birkenhead.—LOAN SANCTIONED.—The Corporation Tramways Committee has received sanction to the borrowing of £6,500 for the reconstruction of portions of the tramway track in Balls Road.

Birmingham.—NEW ROUTE.—The Corporation is seeking powers in the new Corporation Bill to construct a tramway in the new by-pass road to High Street, Erdington.

Chatham.—ABANDONMENT OF TRAMWAY.—The Chatham and District Light Railways Co. is to abandon its tramway system, comprising 16 miles of track, and powers are to be sought from Parliament to replace the trams by motor-omnibuses.

Colne.—ABANDONMENT OF TRACK.—The Corporation has decided to abandon the tramway from Standroyd Street to the Rock Hotel, in the Trawden district, and the road is to be reconstructed at a cost of £9,000.

Continental.—CZECHO-SLOVAKIA.—The *Board of Trade Journal* states that the electrification of the Wilson station, Prague, and sections of line in connection therewith to the extent of some 60 km. is practically completed. As soon as all the electric locomotives are delivered, trains will be operated on the entire length of line which is being electrified.

FRANCE.—In connection with the electrification of the Midi Railway it is now announced that terms have been arranged between the French Ministries of Public Works and Finance and the railway company for the electrification of a further 687½ miles of the system, which, when completed, will bring the length of the electrified Midi system up to nearly 1,220 miles, or about half of the total length of the system. The work is to be spread over a period of five years, and is estimated to cost over £4,000,000, of which about three-fifths will be expended in France, while the remainder will consist of German material supplied on reparations account.

Great Western Railway.—AUTOMATIC TRAIN CONTROL.—*The Times* reports that the directors of the Great Western Railway, at their meeting on October 26th, decided to extend the automatic train control system, at present in operation on the main line beween Paddington and Reading and on certain branches between Reading, Swindon and Oxford, and between London and High Wycombe. The system has been found specially valuable in handling traffic during foggy weather as drivers are given audible warning of the state of the signals whether they can see them or not.

Ilford.—LOAN SANCTIONED.—The Corporation Tramways Committee has received sanction to the borrowing of £7,000 for the reconstruction of the Chadwell Heath tramway track.

Liverpool.—NEW ROUTE.—The Corporation Tramways Committee is to extend the tramway from the city boundary to the premises of the British Enka Artificial Silk factory for the benefit of employés at that and other factories.

London.—NEW L.C.C. TRAMWAY.—The Highways Committee of the L.C.C. has recommended the Council to seek authority in the Parliamentary session of 1928-29 for the construction of a double tramway track from a point near Grove Park station to Well Hall Road, a distance of three miles. The estimated cost of the tramway construction and equipment is £153,735 and the cost of property and works for widening £27,300, making the total cost of the scheme £181,035.

UNDERGROUND GOODS RAILWAY.—It is said in the City that an Anglo-American group of financiers is putting forward plans for a system of underground railways in London for the conveyance of goods only, says the *Evening News*, which states that the scheme is likely to be heard of in Parliament next session.

Telegraph and Telephone Notes.

Australia. — RADIO-TELEPHONY.—Probably within a year a wireless telephone system, costing £45,000, will be in operation between London and Melbourne, says the *Sydney Morning Herald*. The Postmaster-General (Mr. Gibson), who made this announcement in the House of Representatives, also stated that at an early date it was hoped to establish a wireless-telephone service between Tasmania and the mainland, and to provide a metallic telephone circuit between Adelaide and Perth. Inquiries were proceeding, he said, to determine the possibility of introducing wireless-telephony services to replace trunk-line services over long distances in Australia, so that the heavy cost of erecting thousands of miles of wire might be avoided.

AUTOMATIC TELEPHONY.—In a report presented to the Federal Parliament the Public Works Committee recommended that the proposal for the erection of an automatic telephone exchange to serve the western portion of the city of Melbourne and for the conversion of the South Melbourne exchange to six-figure working should be proceeded with immediately. The cost of the undertaking is estimated at £619,783. The new city exchange, the Postal Department suggests, should be followed by the erection of a second building, at about the same cost, to serve the eastern half of the city. It was proposed, says the *Melbourne Argus*, to install 10,000 lines with facilities for extension to 18,000 lines, the estimated growth in 12 years. Of the total cost, £584,540 would be absorbed by the City exchange and £35,243 by the conversion of the South Melbourne exchange to a branch exchange working into City West. The city building was estimated to cost £67,200; the automatic switching plant, £409,391; and sub-station equipment, £55,510. The annual charge of the new automatic system would be £176,674, and five years later, £210,431. The estimated revenue at first was £246,995, and five years later £348,750. The assets from the Central exchange, after the automatic system had been installed, were said to have a recoverable value of £151,411, and at South Melbourne a value of £20,835. The Public Works Committee has also recommended the erection of an automatic exchange at Cairns (Queensland), at a cost of £39,211.

Jugo-Slavia.—TELEPHONE DEVELOPMENT.—According to a report forwarded to the Department of Overseas Trade, more than £1,000,000 is to be spent on improving and extending existing facilities in the Serb-Croat-Slovene Kingdom. Automatic exchanges have already been installed in a number of the large towns, and the Belgrade exchange is shortly to be converted from the manual to the automatic system. It is also proposed to develop the international service so that Jugo-Slavia may be in touch with every European capital.

The Telephone Service.—LARGE ORDER.—A £100,000 telephone order, the largest ever given to the Post Office, has been provisionally placed by Messrs. Douglas Stuart, Ltd., London betting bookmakers. According to the *Financial News*, the scheme is to install a private exclusive line from Messrs. Stuarts' West End offices to an office in every town in England and Wales with a population of over seventy thousand; the installation will thus cover 68 towns.

Wireless Telephony.—ALL-EMPIRE SERVICE.—According to *The Times*, the General Post Office is in communication with the Governments of the Australian Commonwealth, South Africa, and India, with a view to bringing the whole of the Empire into wireless-telephonic communication with Great Britain.

To meet the growing traffic of the transatlantic telephone service, additional buildings and apparatus are being put up at the Rugby wireless station. At present there are at Rugby two channels of speech with America. A third transmitter is being provided, and it is hoped that it will be ready for service next year. The question of providing a fourth transmitter at a later date is under consideration. Should the communications now passing between the General Post Office and the Governments of the more distant Dominions result in an agreement as to the All-Empire telephone scheme, this additional plant at Rugby will enable experiments to be made which it is expected will ultimately add to the greater links of Empire the link of wireless telephony.

Radio Notes.

Germany.—Picture Broadcasting.—The German broadcasting authorities will, on November 15th, start an experimental picture service from the wireless station at Königswusterhausen, the Fulton system of transmission being used as in Vienna and London. The times of transmission will be from 3.30 to 4 p.m. and from 11.30 p.m. to midnight. The service started in Vienna on October 15th from the Ravag station twice per day.

Picture Broadcasting.—The B.B.C. Experiments.—Although picture broadcasting was scheduled to start at 2 p.m. on October 30th, no private listener had any chance of receiving the pictures in his home on that day. There are only a few dozen Fultograph picture receiving instruments in the country, and none of them is for sale. One batch went to the B.B.C., to be used for determining the merit of the transmissions. The rest were to be scattered throughout the country, and demonstrated at big stores and at the Manchester Radio Exhibition. No more receivers will be available for a month. It is expected that the first batch from abroad will be ready by the second half of November, and that 1,000 Fultograph receivers will be in England by December 1st. Soon they will be manufactured in England, on mass production lines, says the *Evening News;* at present they are being made abroad, where they are already in use. All Fultograph receivers are to be of a standard type. The dimensions have been agreed upon; thus any owner of a Fultograph receiver will be able to receive any pictures broadcast by a Fultograph transmitter, whether it is in London, Paris, Berlin, or Vienna. The first series of B.B.C. broadcasts will be from Daventry 5XX on weekday afternoons from 2 to 2.20 p.m. Five pictures will be broadcast in this period.

Regional Broadcasting.—Northern Station.—It is understood that B.B.C. engineers have made a preliminary inspection of sites in the Barkisland area, near Sowerby Bridge, on one of which a high-power broadcasting station may be erected under the regional broadcasting scheme.

Russia.—Short-wave Stations.—The People's Commissariat for Posts and Telegraphs of the U.S.S.R. has decided, says the *Daily Telegraph*, to build several new short-wave radio stations in Middle Asia, namely, in the Pamirs, Khorog, and Hassan-Kuli.

South Africa.—New Station.—What is claimed to be the most powerful broadcasting station in the Empire outside Great Britain was opened on October 22nd by Mr. W. Madeley, South African Minister of Posts and Telegraphs. The station will serve the Union of Rhodesia, and under favourable conditions can communicate with Britain, says the *Evening News*. It is situated on the highest point of the Witwatersrand at an altitude of about 6,000 ft.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—November 28th. Victorian Railways. One 10-ton overhead electric crane. (A.X. 6951.)*
December 18th. Department of Posts and Telegraphs. motor-generator sets. (B.X. 4810.)* Lamps, lamp caps and sockets. (B.X. 4918.)*
December 11th. Telephone generators. (B.X. 4812.)* Instrument cords. (B.X. 4811.)*
December 4th. Submarine telephone and telegraph cable. (B.X. 4818.)*
December 5th. City Council. Insulated fire-resisting cable. (B.X. 4822.)*

Bentley.—November 20th. Electric lighting installation, Middle school. Education department, County Hall, Wakefield.

Bolsover.—Urban District Council Electricity Undertaking. 50 wooden poles, cables and equipment in connection with the lighting of the Whaley Village. (See this issue.)

Bristol.—November 12th. Port of Bristol Authority. Installation of telephone and electric hooter signalling systems on the Eastern Arm Extension of the Royal Edward Dock.

Canada.—November 19th. City of Winnipeg. Two 10,000-kVA and two 450-kVA generators for Slave Falls, Manitoba. (B.X. 4791.)*

Dover.—November 12th. Electricity Department. 2,500 yd. e.h.p. cable, 2,200-V switchgear. (See this issue.)

Dublin.—November 12th. Dublin United Tramways Co. (1926), Ltd. General stores (including cables, lamps, electrical fittings, &c.) for 12 months. Forms of tender (2s. 6d.) from the company's offices, 59, Upper O'Connell Street, Dublin.

Edinburgh.—November 19th. Electricity Supply Department. One 1,000-kW motor convertor. (See this issue.)

Farnworth.—November 16th. Electricity Department. L.p. cables. **(See this issue.)**

Ilford.—The Corporation Electricity Committee is inviting tenders for an additional 1,000-kW convertor for the Grove Road sub-station.

India.—November 15th. India Stores Department. Motor alternator set and testing transformer for Government Test House, Calcutta. (B.X. 4790.)*

London.—Central Electricity Board.—January 4th, 1929. 132,000-V transformers in connection with the South-East England Electricity Scheme, 1927 (See this issue.)

Lourenco Marques.—November 24th. Posts and Telegraphs Department. Materials, including g.i., copper and bronze wire, insulators, galvanometers, telephones, batteries, &c. (C. 2904.)*

Manchester.—November 13th. Tramways Committee. Trolley wire (electrolytic and cadmium copper); tramway poles (steel); tramway pole sleeves. Specifications from the secretary, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand.—Wellington.—November 13th. Public Works Department. Transformers. (B.X. 4775.)*
Christchurch.—November 24th. City Council. Pump, electric motor, valves, and automatic flow recorder. (A.X. 7006.)*

South Africa.—Johannesburg.—December 13th. Department of Posts and Telegraphs. Solder, copper wire and cable. (B.X. 4799.)*
South African Railways and Harbours. December 13th. One 7-ton electrical overhead travelling crane. (A.X. 6989.)*
December 13th. One electrically-driven geared maximum service double planing machine. (A.X. 7064.)*
December 6th. Five 4-wheeled electrically driven traversers and one 5-ton hand-operated overhead travelling crane. (A.X. 7023.)* One 5-ton Diesel-electric caterpillar crane. (A.X. 7015.)*
Cape Town.—November 21st. Electricity Department. House service meters. (B.X. 4809.)*
Pretoria.—December 20th. Department of Posts and Telegraphs. Telegraph materials. (C. 2900.)*

Stoke-on-Trent.—November 14th. Electricity Department. Overhead wiring services for 64 new houses, Sutton estate, Trent Vale. City Electrical Engineer (£2).
December 5th. One natural draught cooling tower. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Barking Town.—U.D.C. Housing Committee.
Installation of electricity. Upney Farm Housing Estate—196 houses and flats :—

H. D. White	£2,521
Edgar C. Porter	2,297
Jackson & Co.	2,004
F. W. Jameson	1,795
H. D. Godfrey	1,728
Ilford Electrical Co.	1,575
E. Beckwith & Co., Ltd.	1,502
H. J. Edwards	1,476
W. H. Sugden & Co., Ltd., ...	1,400
DAVIS, LAWRENCE & CO. (Recommended.) ...	1,390

Parsons Row Improvement Scheme—26 houses (including five shops) :—

H. D. White	£395
Edgar C. Porter	378
Jackson & Co.	326
F. W. Jameson	292
H. D. Godfrey	282
H. J. Edwards	260
W. H. Sugden & Co., Ltd.	260
Ilford Electrical Co.	247
E. BECKWITH & CO., LTD. (Recommended.) ...	245
Davis, Lawrence & Co.	226

Bury.—Town Council. Accepted :—
100 tons of tramway rails.—Cargo Fleet Co., Ltd.

Bradford.—Health Committee. Accepted:—
Electric lighting installation at Leeds Road hospital (£1,249).—Moore & Wright.
Electricity Committee. Accepted :—
Electrical control gear at Valley Road power station.—A. Reyrolle & Co., Ltd.
Recommended :—
Provision of smoke consuming apparatus at power station (£350).—London & South East European Co., Ltd.

Essex.—Education Committee. Accepted:—
Installing electric lighting at Dagenham Halbutt school (£322).—F. R. Skeels.

Glasgow.—The Electricity Committee, after consultation with the Central Electricity Board, recommends the purchase of the following machinery in connection with the standardisation of frequency :—
Rotary convertors (Govan area).—Metropolitan-Vickers Electrical Co., Ltd. (£23,146); English Electric Co., Ltd. (£8,084); Electric Construction Co., Ltd. (£7,668), General Electric Co., Ltd. (£3,131); and Crompton Parkinson, Ltd. (£1,156).

Ilford.—Tramways Committee. Accepted :—
Track points (£170).—Hadfields, Ltd., Sheffield.

Irish Free State. — DUBLIN.—County Borough Commissioners.
D.c. long-hour burning flame arc lamps.—Korting and Mathiesen Electrical, Ltd.
Electric wiring accessories for one year.—Roper Bros., F. W. Parkes & Co., Burgess & Bowes, and Deutsche Kabelwerke, A.G.—*Irish Builder and Engineer.*

Leeds.—Electricity Committee. Recommended:—
Switchgear for the new power station (£74,452).—Ferguson, Pailin, Ltd.

London. — LEWISHAM. — Libraries Committee. Recommended :—
Installation of electric lighting at central library :—

A. J. HEWENS & SONS (recommended)	£339
Payne Brothers	351
Haycraft & Sons, Ltd.	376

GENERAL POST OFFICE.—Dry cells.—Edison Swan Electric Co., Ltd.
ADMIRALTY.—Contact pieces, switches and sockets, springs, &c.—Edison Swan Electric Co., Ltd.

LONDON COUNTY COUNCIL.—Highways Committee.
50 double-decked tramcar bodies in connection with the reconstruction of subway cars :—

ENGLISH ELECTRIC CO., LTD. (Accepted.)	£102,025
Hurst, Nelson & Co., Ltd.	102,025
Brush Electrical Engineering Co., Ltd. ...	105,275

The English Electric Co., Ltd., offered earlier delivery than Messrs. Hurst, Nelson & Co., Ltd., and, with the concurrence of the Finance Committee, the Highways Committee accepted its tender.

METROPOLITAN WATER BOARD. Accepted :—
Telephone cable (£113).—General Electric Co., Ltd.

Portland.—Urban Council. Accepted:—
Underground cable and overhead line (£6,192).—Pirelli-General Cable Works, Ltd.
Transformers (£1,206).—Yorkshire Electric Transformer Co., Ltd.

Salford.—Electricity Committee.
Two 12,000-kVA step-up transformers (£5,582), switchgear (£2,500), neutral earthing switchgear (£928).—Metropolitan-Vickers Electrical Co., Ltd.

Education Committee. Accepted :—
Electric lighting installation for Lower Kersal Council School (£347).—Price & Sons.

Forthcoming Events.

Junior Institution of Engineers.—Friday, November 2nd. 39, Victoria Street, S.W. Kinematograph film, "The Babcock Boiler."
Tuesday, November 6th. Portman Rooms. 7.30 p.m. Bohemian concert.
Friday, November 9th. Annual general meeting.

Institution of Engineering Inspection.—Friday, November 2nd. Royal Society of Arts, John Street, Adelphi, W.C. 5 p.m. "Die Casting." Mr. A. H. Mundey.

Salford Technical and Engineering Association.—Saturday, November 3rd. Royal Technical College. 7 p.m. Short papers by members.

Society of Engineers.—Monday, November 5th. Burlington House, W. 6 p.m. "The Future of Engineering in the Light of Modern Economic Industrial and Political Conditions." Mr. C. R. Enock.

Association of Supervising Electrical Engineers.—Tuesday, November 6th. Junior Institution of Engineers, 39, Victoria Street, S.W. 6.30 p.m. "Law of Patents." Mr. A. P. Thurston.

Royal Institution of Great Britain.—Tuesday, November 6th. 21, Albemarle Street, W. 5.15 p.m. Tyndall lecture: "Co-aggregation *versus* Continuity in the Change of State from Liquid to Vapour." Prof. H. L. Callendar, F.R.S.

Institution of Civil Engineers.—Tuesday, November 6th. Institution, Great George Street, S.W. 6 p.m. Address by the President, Sir B. H. Henderson.

Institution of Heating and Ventilating Engineers.—Wednesday, November 7th. Caxton Hall, S.W. 7 p.m. "Heating and Domestic Installations—the Insurance Point of View." Mr. G. A. Cottell.

Electrical Society of Glasgow.—Wednesday, November 7th. 30, Gordon Street, Glasgow. 7.30 p.m. "Industrial Heating." Mr. J. H. Crossley.

Royal Society of Arts.—Wednesday, November 7th. John Street, Adelphi, W.C. 8.30 p.m. Inaugural address by Sir George Sutton, Bt., Chairman of the Council, on "Fifty Years of British Industry."

Institution of Electrical Engineers.—Thursday, November 8th. Institution, Victoria Embankment, W.C. 6 p.m. "Overhead Electric Lines." Mr. W. B. Woodhouse.

(Wireless Section).—Wednesday, November 7th. Institution, Victoria Embankment, W.C. 6 p.m. Address by the Chairman, Comr. J. A. Slee.

(Mersey and North Wales (Liverpool) Centre).—Monday, November 5th. University, Liverpool. 7 p.m. "Some Considerations of the Economics of Electric Power Production." Mr. W. T. Townend.

(Dundee Sub-Centre).—Thursday, November 8th. University College, Dundee. 7.30 p.m. "Notes on Installation and Maintenance Risks." Mr. J. S. Lilly.

(North-Western Centre, Students' Section).—Thursday, November 8th. Engineers' Club, Manchester. 7.15 p.m. Joint debate with the Institution of Mechanical Engineers (Graduates Section).

(London Students' Section).—Friday, November 9th. Institution, London, W.C. 6.15 p.m. "Loud Speakers." Mr. T. C. M. Lance.

Engineering and Scientific Club (Wolverhampton).—Friday, November 9th. 7 p.m. "The Story of the Tire." Mr. I. D. Patterson.

Faraday Society.—Friday, November 9th. Royal Institution, Albemarle Street, W. 3.30 p.m. Spiers Memorial lecture: "Some Debatable Problems in Physics." Sir Oliver Lodge, F.R.S.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, November 10th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Modern Methods of Firing Steam Boilers." Mr. S. B. Haslam.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

EVERYWAY electric lamps.

Electric bells fitted with a small receptacle on the case to take a flash lamp.

Notes.

An Electrically-equipped Pumping Station.

On October 24th, the first of a series of pumping stations to be used in connection with the new Rochester sewage scheme was officially opened by the Mayor of Rochester. The station is situated on the Strood Fairground, and consists of a large underground chamber containing the necessary sewage pumps and surrounded by a circular collecting pit into which the sewage is gathered. The plant consists of three vertical 6-in. Blackstone "Unchokeable" pumps of the semi-enclosed type, each capable of dealing with 600 gal. per min. against a total head of 89 ft. and running at 970 r.p.m., and a similar 8-in. storm-water pump running at 480 r.p.m. and capable of delivering 1,200 gal. per min. against a total head of 20 ft. The pumps are driven by "Maxtorq" squirrel-cage motors controlled by auto-transformer starters, the former being supplied by the Lancashire Dynamo & Motor Co., Ltd., and the latter by Messrs. Brookhirst Switchgear, Ltd. A clutch coupling is fitted beneath the vertical motor in each case for the pump drive, and this enables the full speed of the motor to be reached before the pump commences to operate. This arrangement obviates the objection which otherwise might exist to using a squirrel-cage motor of considerable horse power. The motors driving the three 6-in. pumps are of 50 h.p. and that driving the 8-in. pump of 25 h.p. The supply is at 400 V, 50 cycles, 3-phase, and all the controls are on the motor floor level.

Electro-farming in Australia.

Important facilities for conducting farming operations under modern conditions have been made available to the Dookie Agricultural College by the supply to it by the State Electricity Commission of electrical energy to operate most of the farming machinery. Officers of the Electricity Commission are anxious to see experiments in electroculture undertaken in Victoria, says the *Melbourne Argus*, and if the authorities of the Department of Agriculture are willing to begin experiments at Dookie it is probable that the Commission will be willing to co-operate by making available the necessary concession rates.

Hydrogen-cooled Machines.

It is claimed that 50 per cent. more power can be handled by a given size electrical apparatus when equipped with a system of cooling introduced by the General Electric Company of America, which uses hydrogen gas within a totally-enclosed rotating machine. The first commercial application of the system is a synchronous condenser installed by the New England Power Company at its Pawtucket, R.I., sub-station. If the condenser were air-cooled its capacity would be 10,000 kVA, but by hydrogen-cooling its capacity has been increased to 12,500 kVA; with hydrogen at 15 lb. per sq. in. gauge pressure, the machine could deliver 15,000 kVA without exceeding the normal temperature guarantees. Oxygen and dirt are excluded by the airtight casing; hydrogen will not support combustion, and it eliminates the effect of corona on the insulation. Hydrogen-cooled equipment, being totally enclosed, can be placed outdoors, with a resultant saving in building cost. The Pawtucket condenser is outside the sub-station. Hydrogen is much lighter than air, and the wind-resistance loss is reduced to about 10 per cent. of the loss in air when hydrogen at atmospheric pressure is used. The explosion-proof cylinder consists of three main sections bolted together and provided with end bells. An extension on one end of the casing encloses the slip-ring mechanism, and a carbon seal is placed around the shaft, where it enters this housing, so that the brushes may be adjusted, or replaced, without losing hydrogen from the main shell. The bearings are supported by structural-steel framework welded to the inside of the casing. The heat absorbed by the hydrogen is removed by four internal surface-type coolers, consisting of nests of pipes arranged concentrically inside the shell close to each end of the casing. Hydrogen is drawn in along the field structure by fans at the ends of the shaft, and is forced radially outward through ducts in the armature laminations; it then passes back along the inside of the shell to the coolers, after which it is recirculated; the cooler pipes are supplied with circulating water. Full automatic operation is used; a pressure-regulating switch and valve maintain the hydrogen pressure sufficiently above atmospheric pressure, so that leakage, if any, will be outward, thus preventing the contamination of the gas by air. A recorder gives a continuous indication and operates an alarm if the purity of the gas falls below 91 per cent.; the gas replacement cost amounts to less than seven cents a day and the loss is made up by hydrogen that is automatically drawn from a bottle of the commercial gas connected to the piping system. Other features include oil-pressure starting, and indicating thermometers which operate alarms if the temperature of the bearings exceeds 60 deg. C., or if that of the hydrogen as it leaves the coolers exceeds 40 deg. C.

American Talking Kinemas.

It is officially announced that the Radio Corporation of America and the Keith-Albee-Orpheum and National Broadcasting and Filmbooking Office Productions have been merged, with the inclusion of various subsidiary interests, says the *Evening News*. By this operation the Radio Corporation of America becomes the giant of the American entertainment industry. The combine will concentrate on the development of the photophone or talking film process, with the probability that television will become part of the programme to be given at 700 Keith-Albee-Orpheum theatres. The new company will be known as the Radio-Keith-Orpheum Corporation.

A Rural Area Tour.

On Tuesday last week, under the guidance of Mr. W. A. Turnbull, borough electrical engineer and manager, members of the Aylesbury Electricity Committee and others made a tour of the rural area of the electricity undertaking, stopping to inspect the equipment of several of the larger or more interesting consumers *en route* and various sections of the overhead lines. Special attention was, of course, paid to the "Aylesbury" pole and to the undertaking's steel-wire line, which were described and illustrated in the ELECTRICAL REVIEW of July 22nd, 1927, p. 135. The area covers approximately 230 sq. miles, and over 1,500 consumers are now connected, the majority of which are small domestic consumers. Most of the available power users in the area have also been induced to take a supply, resulting in a much better load factor. A visit was paid to the Grand Junction Canal pumping station at Tring Ford, where there is a considerable off-peak demand. This installation was taken over by the undertaking last year, when two 250-h.p. vertical motors were installed to replace the old beam engine which had been in service for 125 years. The pumping station of the Chiltern Hill Spring Water Co., at Dancers End, was also visited. This is another valuable consumer which accounts for 75 kW of off-peak load. A halt was made at the Natural Health Healing Home at Champneys, near Tring, where a 50-kW load is demanded for cooking, heating, lighting, and for electro-medical purposes, such as ultra-violet-ray treatment. The Government's Forest Products Research Laboratory, at Princes Risborough, was also visited, and various tests which were in progress at the time for determining the breaking stresses, &c., of timbers attracted considerable attention. An ultimate load of 200 kW is expected to be obtained from this station.

The feature of the outing was perhaps the official opening of the new cement works at Chinnor of the Chinnor Cement and Lime Co. by Viscount Stopford, the mayor of Aylesbury. This is now the largest consumer in the rural area, and is responsible for a load of 660 kW. The supply is taken to the works at 11,000 V by overhead line, and an 865-kVA Ferranti transformer reduces the pressure to 400 V, 3-phase for distribution throughout the factory, *via* industrial draw-out type switchgear of Switchgear & Cowans manufacture. The complete electrical installation was carried out by the Lancashire Dynamo and Motor Co., Ltd. The equipment includes a 350-h.p., 187-r.p.m. motor driving the cement tube mill, a 200-h.p., 187-r.p.m. motor driving the powdered-coal tube mill, and a 125-h.p., 485-r.p.m. motor driving the wash mill, separators and elevators. "Maxtorq" induction motors are used throughout the factory, except for the heavy low-speed drives, for which "Lancashire" self-starting and self-synchronising synchronous motors are installed.

The maximum demand of the Aylesbury rural area is now 1,000 kW, with a load factor of about 40 per cent. There is over 60 miles of 11,000-V, 3-phase transmission line, a large portion of which is 7/12 s.w.g. steel wire, with approximately 40 transformer distributing centres. It was interesting to learn that it is now possible to tap an 11,000-V line and erect the necessary switchgear and transformer for a 10-kVA output for the sum of £30 complete. About 270 cookers, 400 kettles, 300 irons, and 150 bowl fires are now out on hire in the area.

There was one cheerless note from Mr. Turnbull during the tour, and that was in the form of a complaint that the undertaking had apparently reached the limit of its activities, for the time being, at any rate, for reasons out of its control. It is necessary before more consumers can be taken on that the electricity works should be extended or an outside source of supply obtained. Sanction for extensions has been refused by the Electricity Commissioners, and efforts to obtain a bulk supply from the likely surrounding undertakings on an economic basis have proved futile.

Appointments Vacant.

Consumers' clerk (£150+) for the Wimbledon Corporation Electricity Department. Relief shift charge engineer (£225) for the City of Hereford Electricity Department. Switchboard attendant (72s.) for Aylesbury Corporation Electricity Works. Wiremen for the East Dereham Electricity Supply

Department. Switchboard attendant for Doncaster Borough Council Electricity Department. Sales assistant (£250) for the Scarborough Corporation Electricity Department. Shift engineer (£4) for the Willesden Board of Guardians. Deputy city electrical engineer for the City of Bradford Electricity Department. Telegraph foremen (£400) for the Government of the Gold Coast. Stores clerk (£170) for the Borough of Hastings Electricity Department. (See our advertisement pages to-day.)

E.P.E.A. (Kent Section) Annual Dinner.

We are informed that the date of the annual dinner of the Kent Section E.P.E.A. has been altered from November 24th to November 17th.

Mines Research Co-operation.

The British Government recently made proposals to the French Government for a scheme of co-operation between the official organisations in the two countries which are engaged in research work directed towards securing greater safety in coal mining. These proposals have been cordially accepted, and the scheme is now to be put in operation. On the British side the technical arrangements will be in the hands of the Safety in Mines Research Board. They will include a full interchange of information acquired by accident-prevention research and experience in the two countries, including unpublished as well as published reports. The respective research organisations will mutually agree which problems each could best study alone and which could more effectively be studied jointly. By this means it should be possible to save money and expedite the work. There will probably be also an occasional interchange of skilled research workers for work requiring special experience. A very similar scheme of co-operation has for three or four years operated very successfully between the Safety in Mines Research Board and the Bureau of Mines of the United States of America.

E.A.W. Activities.

At Queen's College last week, Lady Brooks presided over a large meeting of members of the Birmingham and Midlands branch of the Electrical Association for Women to launch the "Electrical Outlet Campaign." The scheme was favourably discussed by experts, including Mr. R. A. Chattock (city electrical engineer), but there was a feeling that the "national specification" would involve too high a cost for small houses, though economies could be effected by reducing the number of "outlets" in each room.

Members of the North-East Coast branch of the Association paid a visit on October 23rd to a therapeutic nursing home in Victoria Square, Newcastle-on-Tyne; descriptions of the various types of ultra-violet-ray lamps in use were given by Mr. G. E. L. Boworth, of Edinburgh, who referred to a statement made by Dr. Kerr Russell, of Newcastle, that he had himself cured or greatly relieved 137 diseases by the use of the rays.

The Leeds and West Riding branch of the Electrical Association for Women was addressed on October 24th by Mrs. W. B. Woodhouse, wife of the general manager of the Yorkshire Electric Power Co., Ltd., on "Interior House Lighting."

Extensions at Wallasey.

On October 26th, the Mayor of Wallasey, Alderman Dr. J. McMillan, J.P., officially opened the recent extensions to the Wallasey generating station, which bring the total capacity of the plant up to 28,500 kW. The new plant includes two 50,000-lb. boilers, 300 lb./sq. in., equipped for pulverised-fuel firing and complete with the necessary coal-handling and pulverising plant, all supplied by Messrs. Simon-Carves, Ltd.; one 12,500-kW turbo-alternator, 3,000 r.p.m., supplied by the English Electric Co., Ltd.; and new switchgear supplied by Metropolitan Vickers Electrical Co., Ltd. Following the inauguration ceremony there was a luncheon at the Wallasey Town Hall. The guests included three members of the Central Electricity Board—Sir John Brooke, Alderman Walker and Mr. Frank Hodges—and the electrical engineers and civic chiefs of the neighbouring towns.

The principal speech was that of Mr. Frank Hodges, who remarked that the Central Electricity Board had duties to perform that very intimately affected the future of the stations and engineers. There was a popular notion that because a station was municipally owned, it must be inefficient. His experience with the Board had taught him that provided the electricity committee of an authority was broadminded and wise enough to give its technical staff the fullest scope for the development and utilisation of their knowledge, and kept them free from the trammels of politics, there was no reason why its station should not be amongst the most efficient stations in the country. One of the functions of the Board was to widen the channels through which the technical man worked. Wallasey had accomplished a great deal, and due credit must be given to its technical advisers. The Central Board as a public authority had, he believed, done more creative work in the short time it had been in existence than any other similar body in a comparable time. The Scottish scheme was in the midst of physical construction; in the South-East area the contracts had been placed for the transmission system, and the Central area scheme had been launched. The Board was engaged on the scheme for the North-West of England and North Wales. There were scarcely any frontiers for the use of electricity, but for the next few years the Board was out to eliminate the errors of the past.

Councillor N. A. Larsen, in proposing "The Contractors," said that now the Wallasey station was completed, it would be necessary to concentrate on the sale of energy. It seemed remarkable that when the Corporation went out to buy plant involving the expenditure of thousands of pounds, and asked about twelve different firms to tender, their quotations were within fivepence of each other.

Mr. V. Watlington (English Electric Co.) spoke of the novel character of the Wallasey installation, and on behalf of the contractors presented to the Mayoress of Wallasey a set of cut glass, and to Alderman Hughes (chairman of the Electricity Committee) a canteen of cutlery.

Mr. B. T. Hawkins (borough electrical engineer) replied to many complimentary references by drawing attention to the progressive efficiency of the station and paying a tribute to his staff.

Local Societies.

Mr. S. G. Marston, borough electrical engineer, Stockton, gave an interesting address recently before the Stockton and Thornaby Rotary Club on electricity in the home.

Mr. D. Macfarlane Macleod, chief engineer of the Clyde Valley Electrical Power Co., addressed the Paisley Association of Electrical Engineers on "The Falls of Clyde Hydro-Electric Plant" on October 23rd.

Industrial Lighting.

The first provincial meeting of the Illuminating Engineering Society was held at Birmingham on October 22nd, when Mr. R. A. Chattock, city electrical engineer, Birmingham, presided, and Mr. J. L. H. Cooper read a paper on industrial lighting. Professor Cramp, Birmingham University, led an interesting discussion following the paper. He said the subject was a very difficult one, and the Society was doing an immense service. They were the first, he believed, to introduce any systematic measurement into the science of lighting. Mr. Cooper had apparently suggested 8 or 9 foot-candles as being satisfactory in many instances; but 8 or 9 foot-candles could be obtained with a light the spectrum of which approximated to sunlight, and also with a light which was a very long way from sunlight. There was a very great difference between the two, so far as the workers were concerned. Attempts were constantly being made to provide globes, not only for obscuring and diffusing illumination, but which also gave a reasonable approximation to the colour they were accustomed to in sunlight It was very desirable that there should be more information on that question. Many screens were at present being put forward, but they were still faced with the problem as to whether it was better, economically, to use such screens. The manufacturers needed figures to convince them in the matter of efficient lighting, and if such figures could be collected by the Illuminating Engineering Society, it would be helping forward a very desirable campaign. Flexible systems of lighting were badly needed in this country. His experience in Germany, France, and other Continental countries was that the works lighting systems there were much more flexible than those at home. He had made a collection of the prices of electric lamps over almost the whole of Europe, and the retail prices in England stood higher than those anywhere else. The Society would be doing a great service and would help very materially the modern lighting of engineering works, if it could bring any pressure to bear on the manufacturers of lamps to see that they were sold at a lower price.

Mr. L. E. Buckell said the paper convinced him it was the duty of electrical engineers to educate factory owners in lighting matters more than had been done in the past. He did not think sufficient emphasis had been placed upon the importance of good lighting as a means of avoiding accidents. He knew of one factory where production had gone up by no less than 45 per cent. after the installation of a modern system of lighting.

Mr. Cooper, in reply, said he felt there was a great future for artificial daylight lamps in the engineering industry, but he would not go so far as to recommend the general adoption of that form of lighting. It must be remembered that blue glass had an absorption of about 50 per cent. He agreed that the economic factors of lighting had never been investigated properly.

University of London, University College.

In the Faculty of Engineering, a course of five public lectures on "High-voltage Cables" will be delivered by Mr. Percy Dunsheath, O.B.E., M.A., B.Sc., M.Inst.E.E., on Tuesdays, at 6.30 p.m., beginning November 13th. At the first lecture the chair will be taken by Mr. Roger T. Smith, B.Sc., M.Inst.C.E., M.Inst.M.E., Fellow of the College. The lectures are open to the public without fee or ticket.

Faraday House Old Students' Association.

On Friday last, the 20th annual dinner of the Association was held at the Savoy Hotel, Mr. F. E. Berry, D.F.H., A.M.I.E.E., president, being in the chair. Over 200 members and guests were present. After the loyal toast had been honoured, Lieut.-Col. K. Edgcumbe, R.E. (T.), president I.E.E., proposed "Faraday House and its Old Students," expressing unbounded admiration for the College and its Principal, who had the record number of 340 students under his care. There was plenty of room, he said, for all the good men that Faraday House could turn out in the electrical industry, which was doing good work for humanity in general;

it was not so profitable as it might be—but money-making was not everything. Half the students eventually drifted from the technical side into administrative work; hence they should devote some time to the study of economic questions. A large proportion of them went abroad; that was a good thing—otherwise we should lose ground to our oversea competitors.

Dr. Alexander Russell, F.R.S., responding, said that 2,000 students had passed through the College. Referring to the accident which damaged the fabric of Faraday House last year, he said it gave an excuse for extension of the accommodation which would be available next year. There was no slackening in the demand for students who had completed their training; 162 had obtained posts during the past year. Mr. P. V. Hunter, C.B.E., M.I.E.E., proposed "The Guests," and Sir John Snell, G.B.E., chief electricity commissioner, responded, expressing his great faith in Faraday House. Sir Philip Dawson, M.P., also responded, extolling the future that lay before the electricity supply industry, and Mr. E. F. C. French, O.B.E., president Inst.C.E., expressed the belief that though the progress of electricity was one of the wonders of the age, more mysteries remained to be disclosed than had yet been discovered.

Dr. S. Z. de Ferranti, F.R.S., proposed the health of the chairman, referring to his brilliant record and testifying, as a competitor, to the excellence of his work. In response, Mr. Berry pointed out that transformers made by Dr. Ferranti more than 30 years ago were still at work in an adjoining substation, showing that machinery made in those early days could compare with the products of to-day.

An excellent programme of music contributed to the enjoyment of a very pleasant evening.

Tramways and Light Railways Association.

The annual dinner of the Tramways and Light Railways Association was held at the Hotel Cecil on Friday, October 26th, the Hon. Sir Arthur Stanley (president) in the chair. Proposing "Our Guests," Sir Joseph Nall, D.S.O., M.P., said he saw no reason for despondency in the tramway industry, notwithstanding all that the critics had to say of it from time to time. He believed that the newer form of electric traction, the trolley vehicle, would make a considerable difference in the problem of urban transport in this country, because it had all the advantages of comfort and silence. In due time the tramway industry would undoubtedly come into its own.

Mr. Cyril Hurcomb (Ministry of Transport) briefly responded in the absence of Sir Henry Maybury.

Mr. W. Chamberlain (president of the Municipal Tramways and Transport Association), who also responded, said that if tramway undertakings continued to modernise their systems and did not try to run a 20-year-old tramcar in competition with a modern motor-'bus, they would undoubtedly attain a greater degree of success.

Mr. W. Craig Henderson, K.C., who represented the Association at the Railway Bills Inquiry, proposing "The Tramways and Light Railways Association," dwelt upon the part which tramways had played in allowing the population to live outside the big towns and, referring to the railway Bills decision, said there was one principle which had been adopted in that decision which, in his opinion, was highly dangerous, namely, that municipal tramway enterprise should be granted a limited form of protection, whilst a tramway enterprise, which also used money subscribed by the public, was not given that same protection. In his view, if protection was given at all, it must be on the basis of the statutory obligations and statutory rights and on no other ground.

Mr. C. J. Spencer (chairman of the Council), who replied to the toast, said that the tramway companies had not yet finished their efforts in connection with the railway Bills. The tramway companies were amazed at the decision of the Tribunal. The importance of tramways could not be denied when it was pointed out that no fewer than 5,000 million passengers were carried annually on the tramway undertakings of the country, and the burden of maintaining the greater part of 2,000 miles of roads was placed upon tramway undertakings. On the other hand, the omnibuses did not pay one cent towards the maintenance of the roads, neither did the Government, so far as the roads maintained by the tramways were concerned, and nobody could possibly defend such a position. As to the charges against tramway undertakings that they had failed to keep up to date, want of cash was the cause of that, and that want of cash was due entirely to the onerous burdens placed upon tramways by the Acts of Parliament under which they worked. When tramways were able to be run in an up-to-date manner, they were entirely successful financially and held their own against competition.

The A.S.E.E. Apprenticeship Scheme.

We learn that considerable interest has been taken in the suggestions put forward by the Association of Supervising Electrical Engineers for an apprenticeship scheme for the electrical industry. The bodies interested in the scheme are giving the matter serious consideration, and letters of inquiry are being received from all parts of the country. We understand that it is proposed to call a meeting of representatives of all the organisations concerned, with a view to the formation of a committee whose terms of reference will be to work on agreed principles. The final details of the meeting have not yet been settled.

Photo-telegraphy in Japan.

It is reported from Berlin by the *Daily Mail* that Messrs. Siemens & Halske, the German electrical firm, have erected machines for picture telegraphy at three Japanese cities for the *Asahi* newspaper and the Nippon-Dempo News Agency. The picture service between Osaka and Tokio and between Tokio and Kioto has begun, and others will be opened on the day of the Japanese Emperor's coronation. Pictures of the ceremony will be telegraphed to important towns in Japan.

Institution Notes.

Institution of Electrical Engineers.

Scottish Centre.—The report of the Committee for the 1927-28 session shows that ten meetings were held at Glasgrow (excluding the I.E.E. summer meeting), at which the average attendance was 61. The session closed with a total membership of 697, an increase of 38 during the year.

Dundee Sub-Centre.—The annual report shows that seven meetings were held, at which the attendance averaged 35. The total membership was 67.

Scottish Students' Section.—The annual report states that ten meetings were held at Glasgow, at which the average attendance was 36, and two works visits took place. A meeting was held at Edinburgh to consider the participation of Student members resident in that district.

Meter and Instrument Section.—As was recently announced, the Council of the Institution has set up a Meter and Instrument Section for the reading and discussion of papers on meters, instruments, and cognate subjects. The Section will be conducted on the lines of the existing Wireless Section, and will supersede the Meter Engineers' Technical Association, which, as the result of a ballot of its members, will be dissolved on December 31st, 1928, its work being continued by the Meter and Instrument Section.

Members of the Association who are already members of the Institution, and those subsequently elected into the Institution from the Association's membership, will form the nucleus of the Section. In addition, members of any class of the Institution may apply for membership, and must satisfy the Committee which will be appointed by the Council to arrange the meetings of the Section that they are "actively engaged in the study, design, manufacture, or use of instruments, meters, or protective devices used in electrical engineering."

Members who wish to belong to the Section should apply by letter to the Secretary of the Institution, Savoy Place, Victoria Embankment, London, W.C.2, giving full information as to their qualifications for consideration by the Committee. No supplementary subscription will be payable in respect of membership of the Section. The first meeting will be held shortly, and due notice will be given in the technical Press.

Junior Institution of Engineers.

In a paper delivered on Friday, October 26th, Mr. Geoffrey W. Tookey discussed the nature of the protection afforded by law for originality. He said that as the State considered that in the useful arts the original work should not be withheld from use by the general public, the protection was given for a much shorter period than was the case with copyright. An original idea must be an invention in order to be patentable, and an invention meant, according to the Patent Acts, any manner of new manufacture. A useful test of what was patentable was that a vendible product must be produced. The term of a patent was for 16 years from the date of application, and the protection given did not extend beyond what had been claimed by the inventor.

Monopoly rights were given for designs, and a design meant features of shape, pattern, or ornament applied to any article which did not include any mode of construction. Design protection was very limited, as a slight change in one dimension might be said to produce a new design. Many designs were held to be invalid because the shape was regulated to a certain extent by the form of construction or the purpose for which the article was intended. The life of a design was five years from the date of registration, but this period could be extended for two further periods of five years, making fifteen years in all.

Copyright was the sole right to publish, produce, or reproduce original work of a literary, dramatic, musical, or artistic character, and accrued to the right person automatically without any form of registration being necessary. The term of copyright in literary and artistic works was the life of the author and fifty years after his death.

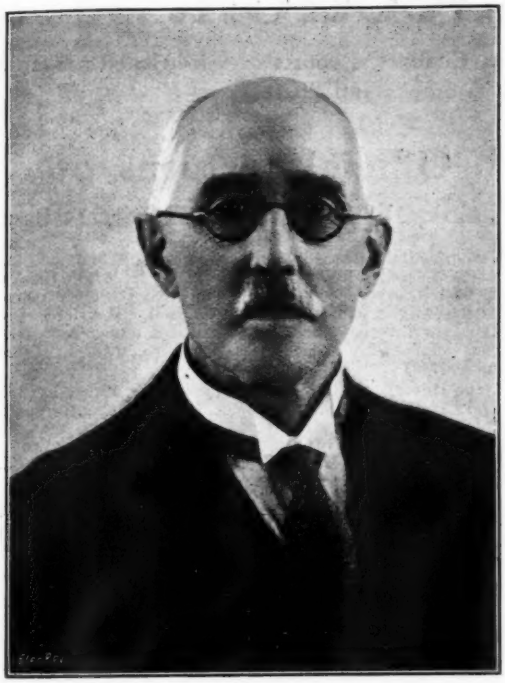
Institution of Chemical Engineers.

On Wednesday, November 14th, a lecture on "Making Rubber Goods of Latex by Electro-Deposition," will be delivered by Dr. Paul Klein, of Budapest, at the Institution of Civil Engineers, at 6.30 p.m. Tickets of admission may be obtained on application.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. Sydney H. Holden, M.I.E.E., is the new chairman of the South Midland Centre of the Institution of Electrical Engineers. He delivered his inaugural address at the Grand Hotel, Birmingham, on October 18th. Mr. Holden, who was



Hudson Studios, Ltd. [*Birmingham*

Mr. Sydney H. Holden,

Chairman of the South Midland Centre of the I.E.E.

born in 1864, was educated at private schools and at King Edward's School, Birmingham. He was for five years laboratory assistant to Dr. George Gore, F.R.S., and for two years with Mr. J. G. Lorrain in London. For the past forty years (from 1888 down to date) he has been on the staff of Messrs. Chamberlain & Hookham, Ltd., electricity meter manufacturers, of Birmingham.

Major F. J. Chapple, general manager of the Yorkshire (Woollen District) Electric Tramways, Ltd., has been appointed general manager of the large combination of motor-'bus companies known as the West Yorkshire Road Car Co., Ltd., with headquarters at Harrogate, and expects to take up his new duties before the end of the year.

Mr. F. A. Cambridge, city electrician of Winnipeg, has announced his intention of retiring after 35 years' service in the city's inspection department.

The Southwark Borough Council Electricity Committee recommends the promotion of Mr. J. Smith, station superintendent, to the position of assistant electrical engineer at a salary of £485 per annum; Mr. G. Taylor, charge engineer, to the position of station superintendent at a salary of £291; and Mr. D. Marshal, mains foreman, as assistant mains superintendent at a salary of £307.

The staff of the Park Royal Engineering Co., Ltd., have presented Mr. W. E. House, of the London sales office, with a silver tray on his leaving the company to take up a position on the sales staff of Messrs. Henrion Carbons, Ltd., Kinnaird House, W.C.1.

At a dinner given in his honour by the members of the Birmingham Tramways Committee and the chief officials of the Tramways Department, Mr. Alfred Baker, who was for 25 years general manager of the system, from which position he retired several months ago, was presented with an illuminated address and a chiming grandfather clock. Alderman Ellaway, chairman of the Committee, presided, and proposed the toast "Our Guest." Mr. McDonnell seconded. The presentation was made by the Lord Mayor, and Mr. Baker responded.

The marriage took place on October 20th, at St. Thomas' Cathedral, Bombay, of Mr. George C. Kim, A.M.I.E.E., assistant electrical engineer to the Great Indian Peninsula Railway, and Miss Beatrice Ridley, of Sheffield.

Mr. W. G. Marks, transport manager to the Chesterfield Corporation, has been appointed tramway manager at Nottingham at a salary of £1,200 per annum. He was formerly assistant manager of the Rotherham tramways, and before that was at Middlesbrough.

The *Daily Telegraph* states that Mr. Joseph Ward, chairman of Messrs. Thos. W. Ward, Ltd., Sheffield, was presented by the staff, on the occasion of the jubilee of the firm, with a piece of Sheffield plate made over 100 years ago by Creswick. Mr. Shepley Green, who has been on the staff for over forty years, made the presentation. Mr. J. Bussey presided.

On October 24th Mr. C. H. Yeaman (city electrical engineer of Stoke-on-Trent) and Mrs. Yeaman received a presentation from the members of the City Council Electricity Committee to mark their recent marriage. Ald. G. Hassall (chairman of the Committee), who made the presentation, paid a tribute to Mr. Yeaman's ability and to his devotion to the interests of the undertaking and of the city.

Mr. Cecil Hodges informs us that he has no connection with any company bearing his name, with the exception of the Hodges Switchgear Co., Ltd., of the Wool Exchange, London, E.C.2, which is manufacturing his latest designs in switchboards, distribution boards, electric lighting plants, and pumping sets. The above is his sole address.

Mr. F. S. G. Hinings, whose portrait appears herewith, delivered his address as chairman of the North Midland Centre of the Institution of Electrical Engineers on Tuesday last at Leeds. Mr. Hinings was educated at Blundell's School, Devon, and went to Leeds in 1901 to serve a bound apprenticeship of four years in engineering with Messrs. J. H. McLaren & Co., under the direction of the late Sir John McLaren. He passed through the different shops and reached the drawing office, where he gained experience in the designing, erecting, and testing of reciprocating engines up to 3,000 h.p., which were supplied to many electric power stations. He took part in the official tests of two 1,500-kW sets supplied to the city of Leeds,

Mr. F. S. G. Hinings,

Chairman of the North Midland Centre of the I.E.E.

under the late Mr. Robert Hammond, who was then consultant to the Leeds undertaking. At the time these were the largest high-speed sets of the reciprocating type in the country. Mr. Hinings received technical training at the Bradford Technical

College and the Leeds University. In 1906 he was appointed a shift engineer at the Whitehall Road station, Leeds, under the late Mr. Harold Dickinson. He was promoted to a position in the mains and installation department of the undertaking, which he held until the end of 1909. Early in 1910 he joined the staff of Mr. R. A. Chattock at Birmingham as chief assistant in the consumers' and commercial department. While he was at Birmingham five surrounding boroughs were incorporated in the city. This brought about work of a special character to the Electricity Department and Mr. Hinings had to deal with the consumers in the added areas and arrange new supply agreements. In 1914 he joined the British Electric Transformer Co., Ltd., and has acted as its representative in the North of England and Scotland since that time. Mr. Hinings has many friends in electricity supply undertakings—both company and municipal.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Continuous Gramophones, Ltd.—Registered as a public company October 26th. Capital, £225,000 in 5s. shares. Objects:—To adopt agreements with (*a*) W. R. Oyston, F. A. Lakin, M. Brash & Co. Proprietary, Ltd., and H. D. Brash; and (*b*) with the Dominion Finance Co., Ltd., to develop and exploit the inventions, patent and analogous rights mentioned in the first agreement, and to carry on the business of manufacturers of, and dealers in all kinds of gramophones, radio sets and appliances, telephones, &c. The subscribers (each with one share) are:—B. F. Race, "Fernbank," St. Andrew's Road, Coulsdon, law stationer; H. H. Endersby, 81, Grafton Road, Chadwell Heath, accountant; and five clerks. The Dominion Finance Co., Ltd., is entitled to appoint a director after the first general allotment of shares. Solicitors: Gilbert Samuel & Co., 5 and 6, Great Winchester Street, E.C.2.

Sturtevant Engineering Co. (Argentina), Ltd.—Private company. Registered October 26th. Capital, £20,000 in £1 shares (5,000 8 per cent. cumulative preference and 15,000 ordinary). Objects:—To carry on the business of mechanical and electrical engineers and contractors, ventilating, heating, cooling, drying and electrical apparatus manufacturers and dealers, electricians, &c. The first directors are:—G. A. Mower and G. R. Thursfield, 147, Queen Victoria Street, E.C., engineers; and Capt. L. M. Paterson, address not stated. Registered office: 147, Queen Victoria Street, E.C.

Bate Electrical Co., Ltd.—Private company. Registered October 25th. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrician, and manufacturer and general merchant and dealer in electrical appliances, &c., carried on by C. L. Tucker at 6 and 7, Creed Lane, Ludgate Hill, E.C., as the "Bate Electrical Company." The first directors are: C. L. Tucker, Berkeley Lodge, Berkeley Road, Chalk Farm, N.W.1, designer; W. C. Davey, 433, Hale End Road, Highams Park, engineer.

Midhurst and District Electricity Co., Ltd.—Public company. Registered October 25th. Capital, £10,000 in £1 shares. Objects: To take over the Midhurst and District Electricity Special Order, 1927, and to carry on the business of an electric light and power supply company in all its branches. The directors are: J. Macgregor, 2, Kidbrooke Park Road, Blackheath, S.E.3 (managing director of Johnson & Phillips, Ltd.); C. Stewart, "Blantyre," Beaconsfield Road, Blackheath, S.E.3 (director of Johnson & Phillips, Ltd.); L. Barrett, 6, Mortimer Road, Cambridge (managing director of Baily, Grundy & Barrett, Ltd.). Registered office: 12, Union Court, Old Broad Street, E.C.2.

J. W. Gray & Sons, Ltd.—Private company. Registered October 23rd. Capital, £3,000 in 5s. shares. Objects: To acquire the business of electrical and general engineers now carried on by A. Hands and J. W. Forrester at 91, Leadenhall Street, and Saracen's Head Yard, Fenchurch Street, E.C., as "J. W. Gray & Son," "Alfred Hands & Co.," and "A. Gray and Co." The directors are: A. Hands, 13, Westbourne Grove, Westcliff-on-Sea; J. W. Forrester, Romsdal, Hadley Road, New Barnet.

Universal Gramophone and Radio Co., Ltd.—Private company. Registered October 25th. Capital, £100 in £1 shares. Objects: To carry on the business of dealers, importers, manufacturers, factors, agents and licensees of phonographs, gramophones, records, and musical instruments of all kinds, television apparatus, electrical and wireless apparatus and accessories, &c. The subscribers (each with one share) are: W. H. Walford, 10, Lambourne Road, Leytonstone, E.11, clerk; J. H. Chapman, 78, Algernon Road, Lewisham, S.E.13, clerk; W. J. Yeoman, 244, Lordship Lane, East Dulwich, S.E.22, clerk. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.2.

Official Returns of Electrical Companies.

Underground Electric Railways Co. of London, Ltd.—Trust deed dated October 15th, 1928, to secure £4,000,000 5 per cent. first mortgage debenture stock, with power to increase the issue on the terms therein mentioned. The deed constitutes a specific charge on stocks, shares and debentures in various companies. Trustees: Baring Bros., Ltd., 8, Bishopsgate, E.C.

Clear Hooters, Ltd.—Issue on September 19th of £89 1s., and on October 9th, 1928, of £63 0s. 8d. first debentures, parts of "D" series already registered. Satisfaction to the extent of £608 10s. 10d. on October 9th, 1928, of third debentures dated May 5th and July 18th, 1927, securing £5,537 16s. 6d.

Wantage Electric Supply Co., Ltd.—Capital, £6,000 in 600 cumulative preference shares of £5 each and 3,000 ordinary shares of £1 each. Return dated July 18th, 1928. 240 preference and 2,202 ordinary shares taken up. £3,402 paid. Mortgages and charges, nil.

H. T. Boothroyd, Ltd.—Capital, £20,000 in 5,000 preference and 15,000 ordinary shares of £1 each. Return dated May 10th, 1928. 5,000 preference and 12,000 ordinary shares taken up. £7,000 paid, £10,000 considered as paid. Mortgages and charges, nil.

Electrical Power Fitting Co., Ltd.—Capital, £500 in £1 shares. Return dated April 14th, 1928. 305 shares taken up. £218 3s. 10d. paid (leaving £86 16s. 2d. in arrears). Mortgages and charges, nil.

Pettigrew & Merriman (Continental), Ltd.—Capital, £3,000 in £1 shares. Return dated June 14th, 1928. All shares taken up. £3,000 paid. Mortgages and charges, nil.

E. H. Millington & Co., Ltd.—Capital, £2,000 in £1 shares. Return dated August 30th, 1928. 752 shares taken up. £752 paid. Mortgages and charges, nil.

Newton Bros. (Derby), Ltd.—Satisfaction in full on October 12th, 1928, of debentures secured by trust deed dated February 14th, 1927, securing £30,000.

City Notes.

Prospectus.

Recordaphones, Ltd.—The registration of this company was reported in our last issue (p. 723). Its objects are to manufacture and sell an electrical device, the "Recordaphone," for recording telephone conversations, &c. Last week the company offered for subscription 300,000 8 per cent. participating preference shares of 10s. each and 300,000 deferred shares of 1s. each at par. The prospectus gave the directors' names as follows:—Chairman: Mr. C. K. Sugden (chairman and managing director of the Vocalion Gramophone Co., Ltd.); Mr. J. A. Moodie (chairman of the Scottish Finance Co., Ltd.); Mr. H. Gardner (chairman of the Bowden Brake Co., Ltd.); and Mr. A. E. Bowyer-Lowe (chairman of the Radio Manufacturers' Association). It was announced later that Lt.-Col. Adrian Simpson, late of Marconi's Wireless Telegraph Co., Ltd., had joined the board. The registered office (*pro tem.*) is at 11, Waterloo Place, S.W.1. The company is acquiring patents from British Telegraphones, Ltd., for the sum of £75,000, payable as to £20,000 in cash, £35,000 in deferred shares, and the balance (£20,000) at the option of the company in cash and/or shares. It is estimated that £100,000 will be available for working capital. Apart from telephone installations, the company expects to derive profit from the sale of cabinets, models, double recordaphones, loudspeaker electric recordaphones, semi-automatic recordaphones, automatic radio recordaphones, listening machines for typists or similar work, machines for shaving records, sale of records, &c.

Everlite, Ltd.

The registration of this company was recorded in our last issue (p. 723). On Monday last the company published, for information only, a statement of its constitution and objects. The directors are the Marquis of Winchester (chairman), Sir Godfrey B. H. Fell, K.C.I.E., C.S.I., Mr. H. J. Bruce, C.M.G., M.V.O., and Mr. J. L. Blum, the last two are directors of the Metropole Gramophone Co., Ltd. The secretary is Mr. C. A. Missing, and the registered office is at 46, Frederick's Place, Old Jewry, E.C.2. It was stated that the company was formed to "acquire and develop an invention relating to a novel, simple and economical method of generating electricity by the medium of a hermetically-sealed wet battery," the discovery of Dr. Alfred Schmidt, Professor of Physico-Chemistry in the Basle University. "In the application of the invention to lamps and similar articles, many advantages are claimed, the principal being that the light generated remains constant throughout the life of the charge, that refills, which are cheap, can be easily and safely transported and stored, that they do not deteriorate by keeping, and are not affected by climatic conditions, and that the lighting cost is very small." The company is paying the vendors (Metropole Developments, Ltd.) £30,000 in cash and £17,500 in shares.

Marconi's Wireless Telegraph Co., Ltd.

The committee representing the £1 ordinary shareholders points out in a circular just issued that the need for protection through the committee arises from the fact that, while according to the best legal opinions obtainable, the £1 ordinary shares rank for dividends and in a winding-up for a return of capital for twice the amount of the 10s. ordinary shares, the board appears to contemplate an exchange of shares on a basis which would be less favourable to the holders of the £1 ordinary shares than would be the case if all the assets of the Marconi Co. were sold for shares in the merger company, and if the latter shares were distributed in a winding-up among the Marconi shareholders according to their legal rights. The committee awaits the publication of the scheme before formulating considered proposals for the protection of the £1 ordinary shareholders.—*Financial News.*

Pernambuco Tramways and Power Co.

The American and Foreign Power Co., New York, which already holds a controlling interest in the company, has offered to purchase the whole or part of the remaining ordinary and preference shares. The prices offered are 10s. each for the ordinary shares and 21s. each for the preference. No dividend has ever been paid on the £1 ordinary shares, but a regular distribution has been made on the preference shares for the past three years.

English Electric Co. of Canada.

The proposals for the reconstruction of the company's capital have been approved. Under the scheme the holders of the preferred shares receive in exchange for each of their shares two "A" shares and half a "B" share. The holders of common shares will receive one "B" share per common share.

United Electric Tramways of Caracas, Ltd.

There is an available balance of £45,854 from the past year's working, and the directors propose to carry forward the whole amount. A dividend of 10 per cent. was paid in the preceding year. A subsidiary company has been formed to run omnibus services.

Electrical Distribution of Yorkshire, Ltd.

An extraordinary general meeting is called for November 6th to consider a proposal to raise the company's capital to £1,500,000 by the creation of 500,000 £1 shares ranking, *pari passu*, with the existing capital.

Ever-Ready Co. (Great Britain), Ltd.

The directors have declared interim dividends for the half-year ended September 30th as follows:—At the rate of 10 per cent. per annum on the preference shares, and 10 per cent. actual on the ordinary shares.

Joseph Lucas, Ltd.

The profit for the year ended August 31st last fell slightly to £220,660. The ordinary dividend and bonus are maintained at 25 per cent., and the contribution to reserve is again £50,000.

City of Buenos Ayres Tramways (1924), Ltd.

A dividend of 1s. 3d. per share has been declared in respect of the quarter ended September 30th.

River Plate Electricity Co.

An interim dividend of 3 per cent. on the ordinary stock is announced, as last year.

Dutch Company.

Philips Glowlamp Works.—The Amsterdam correspondent of the *Financial Times* reports that the raising of the capital from 40 million to 100 million florins has been approved. Mr. A. S. Philips stated at the meeting that some important scientific discoveries were soon to be put on the market. At the beginning of next year sixteen glass-blowing machines were to be installed in the company's factory.

Stocks and Shares.

MONDAY EVENING.

THE gamble in gramophones and other popular shares gives indications of slackening, and the Stock Exchange markets are not quite so active as they have been of late. Business has fallen off to some extent. The settlement completed last week was one of the heaviest of the present year, so far as industrial shares were concerned. Oddly enough, in certain parts of the Stock Exchange—more especially those connected with mining shares—the position is as quiet as it is, as a rule, in the middle of summer, with the result, naturally, that dealers who have hitherto confined their attention to mines, are migrating into the more popular sections, thereby adding, by the way, to the congestion which prevails in the industrial markets.

The main excitement of the moment is centred around Mond Nickel shares. The chairman of the company, Lord Melchett, is a man of wealth and of vision, his ideas ranging over a very wide area of industrialism, and embracing various branches of trade directly or indirectly connected with electricity.

London's Tramways.

On Tuesday in this week, the L.C.C. was to hold a meeting for consideration of the proposal to merge the tramway system into the Traffic Combine. There is nothing new in the idea. It has been mooted on many previous occasions, and reflected in these columns when the possibility of such an event served to attract attention to tramway shares. Writing in advance of the meeting, it is unnecessary to do more than refer to the proposals that the Underground Electric Railways of London shall assume control of the tramways for a fixed period, the tramways to have their charges shouldered by the common fund of the Traffic Combine. Probably the suggestion would have borne fruit long ago, had it not been for the determined opposition offered to it by the Labour Party—which is, of course, a powerful body on the L.C.C. But circumstances have forced the pace of late, and, whatever may be the result of the negotiations this week, it may be taken for granted that sooner or later the merger will materialise into fact. For it is very clear that, even if the tramways are getting into a stronger position than they occupied previously, they are likely to do still better under the control of the experienced body of business men who govern the Traffic Combine.

Effect upon Prices.

On the strength of expectations raised by these proposals, London United Tramways rose from one-and-six to nearly half-a-crown, the preference gaining 1s., at 8s. 3d., and the 4 per cent. debenture stock being left unchanged at 60¼. Interest on this last-named stock is regularly met, and the yield on the money comes to 6⅔ per cent. London and Suburban Traction preference, which carry considerable arrears of dividend, are 1s. higher at 11s. 6d. and the ordinary shares show an equal gain at 4s. Metropolitan Tramways ordinary are 2s. 6d. buyers, though they changed hands last at sixpence each, three months ago; the preference have barely moved since business in them was done at 6s. on August 8th this year. Of the Tube Railway stocks Metropolitans drooped to 65, and Underground Electrics, after a slight rise, reacted to their previous prices.

Foreign Traction.

Brazilian Tractions are 3 up, but a quieter market after their breathless rise of 8 points last week. The preferred at 230, have added 5 more to their gain, last week, of 30. There is an active business doing in the common shares. Hydro-Electrics improved to 36, while International Holdings eased off to 14¼. Rio de Janeiro Tramway 5 per cent. bonds have been taken at 99, and the company's 5 per cent. mortgage bonds came to business at 90. The anticipated offer to holders of Pernambuco Trams has duly materialised. The ordinary shareholders are offered 10s. and the preference 21s. for their interests. It appears prudent to accept these offers. Barcelona Trams at 64 are 2 higher on the week. In the Canadian utilities, a rise to 108½ in Montreal Light & Power is offset by a decline to 87½ in Shawinigan. It is announced that the proposed capital reorganisation scheme has been passed by the proprietors of the English Electric Company of Canada.

Electricity Supply and Power.

In the electricity supply group, County of London Electric ordinary shares stand out with an advance to 43s. 6d. Speculation is active in these shares, and it was started, as previously mentioned, by the excitement that carried up Bournemouth and Poole to 67s. 6d. The latter hold their gain, and Richmond (Surrey) keep strong at 45s. Egham and Staines further improved to 39s. Metropolitans lost 9d. at 46s. 3d. Urbans continue in lively demand, and the price, now ex dividend, is again up 2s. 6d. to 39s. 6d. Of the provincial shares, Midland Counties came into request and rose to 31s.; Clyde Valleys hardened to 40s. 6d. The Yorkshire Electrical Distribution Company will take powers next week to create half a million additional shares of £1 each to rank, *pari passu*, in all respects with the shares of the original capital of £1,000,000.

Wireless and Cables.

Nothing fresh has transpired in connected with Marconis, and the strong buying that was reported last week from the United States has not been carried further, although the price remains steady at 76s. 3d. The violent rise in the price of Canadian Marconis, which forced the shares to 41s. 3d., tempted profit-taking by people on this side who hold the shares at much lower figures, and Canadian Marconis therefore fell back to 36s. Marconi Marines hardened to 55s. 6d., due to dividend expectations, and the £1 shares of the parent company remain at 4¾. A meeting was held in Dublin of the Marconi Irish Shareholders' Association a week ago, when a resolution was passed expressing satisfaction with the outlook for the 10s. shareholders.

While Marconis have remained quiet, cable stocks have been going ahead. Rises occurred in three of the members of the group, and optimism is expressed as to the likelihood of the stocks and shares receiving treatment that will make the prices worth more than the current levels. In spite of the heavy character of the shares and stock, a good deal of business is taking place in the securities, attention disregarding the very modest yield offered on the basis of the current dividends, and looking to the time when distribution of stocks and shares in the new companies will take place. Indo-Europeans have regained their dividend of 12s. 6d. deducted from the price on October 25th. United River Plate Telephones improved, upon maintenance of the 3 per cent. interim dividend.

Manufacturing Co-operation.

Metropolitan-Vickers ordinary shares rose 2s. 3d. to 46s. 3d. on the announcement of a plan of co-operation between this company, Edison Swan, British Thomson-Houston and Ferguson Pailin. The companies are to preserve their individual identities and goodwill. Edison Swan shares are unchanged. British Thomson-Houston 7 per cent. debenture is now quoted ex the interest payable on Thursday in this week, and can be bought at 104½ xd. Reference was made here last week, on page 726, to the sinking-fund in operation for repayment of a certain proportion of this stock, every year, at 100. A decline of 1/16 in Siemens, to 28s. 9d., is the only other noticeable change in this section.

Miscellaneous.

Ever-Ready shares are a few pence down at 26s.; the company has declared an interim dividend of 2s. less tax, being the same as that of a year ago. Everlite shares of 1s. each were started at about 12s. 6d., but drooped to 11s. on profit-taking sales by allottees in the Metropole Gramophone Company. New companies are being formed, and projected, to deal with the principle of automatic change of records on gramophones. A new amalgamation, in the United States, is reported between the Radio Corporation of America and certain film-broadcasting-television companies. Burndept Wireless shares at 7s. 4½d. are a shade lower. The new Mersey Power 6 per cent. preference commanded a premium of 1s. 6d. from the commencement of dealings. Rubber shares have come to life with a fairly general rise in prices throughout the list.

Supply and Demand.

Annoyance is sometimes expressed by would-be purchasers of certain stock at their being unable to obtain the offer of the security that they require, the reason being that there is none in the market. The intending investor demands to know why double prices are quoted in the Stock Exchange Official List if, when a man wants to buy, he is told there are no sellers. It is not always recognised that no compulsion rests upon a jobber in any market to make a price—that is, to quote two prices—without knowing what a broker wants to do—at the higher of which he is obliged to sell, and at the lower, he must buy, if he makes the price. In a free market, where stock is constantly changing hands, *e.g.*, the War Loan or County of London Electric, the jobber can always depend upon getting even. He knows where to find stock if he sells, and, on the other hand, he has the certainty of a buyer if he purchases. But when stock rarely comes to market, he cannot be expected to make a price in some stock of which he happens to have none on his own book, and which he has no reasonable assurance of being able to get if he should sell it. Buyers don't want to wait for months before they receive delivery, and although bargains are often done with the proviso that a buyer shall not press for delivery, the buyer will allow only what he considers a reasonable latitude. Meanwhile, during the waiting period, there may be other buyers come along whose demand serves to put up the price against the jobber who has sold and cannot get any stock to supply the demand.

An Illustration.

To give a practical example of what can take place, the 4 per cent. debenture stock of the South Metropolitan Electric Tramways may be cited. Of this stock there have been buyers for some time past, but no supply is available. The nominal quotation is 77 to 81. The stock last changed hands, however, at 65½, in May this year. We are not saying, of course, that the man who gave 65½ is still awaiting delivery. In all probability the transaction was concluded months ago. But the price has gone up some 15 points owing to the facts that no stock has come in, and that buyers continue to want it. Deceased accounts frequently release stock, though in the particular example quoted, there have been no realisations, by executors, of this security.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1926.	1927.	Price Oct. 29, 1928.	Rise or fall.	Yield, p.c.
	£					
Bournemouth and Poole	1	14†	15	8⅜	—	... ...
Brompton Ordinary	1	8⅜	8½	27/-	—	5 8 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	27/6	—	5 1 10
City of London	1	10	10	33/3	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	40/6	+6d.	3 19 3
County of London	1	7½	7½	43/6	+1/-	3 8 9
do. do. 6% Pref.	1	6	6	23/6	—	5 2 3
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	57/-	—	3 17 2
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	31/-	—	4 16 9
London Electric	1	8½	8½	27/-	—	5 3 8
Metropolitan	1	8	9	46/3	—9d.	3 18 0
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/-	+1/-	4 3 10
Mid. Elec. Power	1	—	15	40/-	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	27/6	—	4 7 5
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/- xd	+6d.	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	33/-	—	4 17 0
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	39/6xd	+⅛	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 8 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	23/9	—3d.	6 6 4
Yorkshire Elec.	1	8	8	33/-	—	4 5 4

Home Rails.

Central London Ord. Assented ...	Stock	4	4	73	—	5 9 7
Metropolitan	,,	3	3	65	—½	4 12 4
do. District	,,	3½	4	79	—	5 1 3
Underground Electric	£1	1½	5	26/-	—	3 15 6
do. do. Income ...	Bonds	6	6	125	—	4 15 3

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	109½	—	5 17
do. Def.	,,	1½	1½	24½	—	6 9 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	25⅞	+⅛	*3 18 6
Eastern Tel. Ord.	Stock	10	10	257	—	*3 18 0
Globe Tel. and T. Ord.	10	10	10	26½	+⅛	*3 15 6
do. do. Pref.	10	6	6	11⅛	+⅛	5 8 1
Great Northern Tel.	10	20	20	29	—	... ...
Indo-European	25	10	10	47½xd	+⅜	*5 5 3
Marconi	10/-	5	*10½	8½	—	... ...
Marconi-Marine	1	8½	12½	55/6	+6d.	5 8 1
Oriental Telephone Ord.	1	12	12	8	—	*4 0 0
United R. Plate Tel.	5	8	8	9	+5/-	*4 9 0
Western Telegraph	10	10	10	25⅞	—	8 18 9

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	8½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	79½	+1	6 5 9
British Electric Traction Def. Ord.	,,	—	—	545	+5	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	73½	+3	9 7 9
Brit. Colombia Elec. Rly. Pcs. ...	Stock	5	5	96½	—1	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/6	+1/-	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 8
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	7⅞	—	... ...
do. 7% Pref.	100	Nil	7	79½xd	—	8 16 2
do. 1st Bonds	—	5	5	76½	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	13	15	3⅞xd	—	*4 7 9
British Aluminium Ord.	1	10	10	2¾	—	*4 9 6
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅞	—	3 11 9
Brush Ord.	1	10	10	28/9	—	6 19 2
Callenders	1	15	15	4⅞xd	—	3 11 6
do 6½% Pref.	1	6½	6½	1¾	—	5 4 0
Crompton Parkinson Pref Ord. ...	1	—	6	19/-	—	6 6 4
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 9
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅛	—	4 8 4
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	3	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	—	5 4 0
do. Ord.	1	7½	10	42/-	—	4 16 5
Henley	1	25	25	5¼	—	4 5 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	8	86/3	+2/3	3 6 4
do. Pref.	2	8	8	2½	—	5 19 5
Siemens Ord.	1	7½	7½	1⅛	+1/2	5 4 2
Telegraph Construction	12	10	10	25	—	*4 16 2

*Dividends paid free of Income Tax.

†4% of which was tax free.

United States Electrical Exports.

Two Years' Figures Compared.

BELOW are shown the values of electrical machinery and apparatus exported from the United States during the twelve months ended June last. Comparative figures for the twelve months ended June, 1927, are added and notes of increases or decreases are given.

	Twelve months ended June, 1927. Value. Thous. $	June, 1928. Value. Thous. $	Inc. or dec. Thous. $
Electrical machinery and apparatus (total)	83,199	87,192	+3,993
Generators—			
Direct current			
Under 500 kW	986	1,023	+ 37
500 kW and over	460	926	+ 466
Alternating current—			
Under 2,000 kVA	192	151	– 41
2,000 kVA and over	1,122	850	– 272
Steam turbine generator sets	979	1,850	+ 871
Accessories and parts for generators	978	1,210	+ 232
Self-contained lighting outfits	1,274	1,309	+ 35
Batteries—			
Flashlight batteries	2,026	2,619	+ 593
Other primary batteries	2,258	2,747	+ 489
Storage batteries	3,537	3,511	– 26
Transforming or converting apparatus—			
Power transformers	2,080	1,797	– 283
Other transformers	1,301	821	– 480
Rectifiers, double-current and motor generators, dynamotors, synchronous, and other convertors	1,571	1,792	+ 221
Transmission and distribution apparatus—			
Switchboard panels, except telephones	984	2,095	+1,111
Switches and circuit breakers over 10 amps.	2,332	1,868	– 464
Fuses and fuse blocks	361	398	+ 37
Watt-hour and other measuring meters	469	665	+ 196
Volt-, watt- and ampere-meters, and other recording, indicating and testing apparatus	2,089	1,903	– 186
Lightning arrestors, choke coils, reactors, and other protective devices	706	795	+ 89
Motors, starters, and controllers—			
Motors under 1 h.p.	2,190	2,932	+ 742
Stationary motors—			
1 to 200 h.p.	3,146	2,796	– 350
Over 200 h.p.	565	424	– 141
Railway motors	1,099	963	– 136
Electric locomotives—			
Railway	1,012	1,121	+ 109
Mining and industrial	607	701	+ 94
Starting and controlling equipment—			
For industrial motors	1,292	1,386	+ 94
For electric railway and vehicle motors	198	293	+ 95
Portable electric tools	748	1,176	+ 428
Accessories and parts for motors	2,197	2,427	+ 230
Electrical appliances—			
Electric fans	1,054	885	– 169
Electric lamps—			
Metal filament	1,688	1,396	– 292
Other electric lamps	333	527	+ 194
Flashlights	2,175	2,637	+ 462
Searchlights and projectors	866	678	– 188
Motor-driven household devices	2,193	2,277	+ 84
Domestic heating and cooking devices	1,635	1,415	– 220
Industrial electric furnaces and ovens	299	544	+ 245
Therapeutic apparatus, X-ray apparatus, galvanic and faradic batteries, &c.	1,580	1,636	+ 56
Signal and communication devices—			
Radio apparatus—			
Transmitting sets and parts	374	620	+ 246
Receiving sets	3,116	3,133	+ 17
Tubes	968	1,022	+ 54
Receiving set components	2,244	2,467	+ 223
Receiving set accessories	2,551	2,576	+ 25
Telegraph apparatus	1,117	859	– 258
Telephone apparatus—			
Instruments	391	329	– 62
Telephone switchboards	1,166	433	– 733
Other telephone equipment	2,567	2,665	+ 98
Railway signals, switches, and attachments	617	749	+ 132
Bells, buzzers, annunciators and alarms	297	370	+ 73
Other electrical apparatus—			
Spark plugs, magnetos, and other ignition apparatus	1,865	2,092	+ 227
Insulating material	1,337	1,312	– 25
Metal conduit, outlet, and switch boxes	1,089	1,234	+ 145
Sockets, receptacles and lighting switches	1,813	1,841	+ 28
Electric lighting fixtures, interior and street	1,789	2,247	+ 458
Other wiring supplies and line material	1,122	1,207	+ 85
Electrical apparatus n.e.i.	8,003	7,303	– 700

South African Electrical Trade.

The United Kingdom's Predominant Position.

IN a report upon the economic conditions in South Africa transmitted to the Department of Overseas Trade (Stationery Office, 2s. net), Mr. N. Elmslie, Senior Trade Commissioner in the Union, recalls that the last report upon the subject was prepared by his predecessor in 1924. In the four succeeding years the Union has enjoyed considerable prosperity, and there has been no serious check to the steady development and progress of the country. The financial position has been good; in each year there has been a Budget surplus, and the number of failures and total liabilities have been much reduced.

Exports have steadily expanded; this expansion has not been due to any particular item, but is of a general nature; the proportion of mining products to the whole has remained at about two-thirds throughout. Exports of this class are expected to grow but slowly, and the same is said regarding agricultural products. Manufactured goods cannot be considered, at present, as possible contributors of any consequence to export values. Imports may be expected to maintain their present volume and improve at an equal pace with exports. The increase in home manufacturing, which is being actively fostered by the Government, will reduce importation in certain directions, but the requirements of industrial plant and machinery and raw materials will be greater.

Trade with the United Kingdom.

Since 1922 the proportion of imports of United Kingdom origin has fallen from 56.4 per cent. to 44.8 per cent. (1927). Mr. Elmslie attributes this decline to a combination of factors, many of which are beyond the control of British manufacturers and exporters. Three minor causes are said to be the development of local industries, the withdrawal of the general preferential rebate of Customs duty on imports of United Kingdom origin by the Customs Act of 1925, and the greatly increased proportion of direct Government imports which have been obtained from countries other than the United Kingdom. The main factor, however, is said to be the high prices which are invariably asked for British goods. In this connection Mr. Elmslie says that there is a good prospect of improvement. The market is essentially one in which cost

is the main consideration, quality and other factors being of less importance in a large proportion of the trade than they are in some other markets. Another most important factor is the complaint that British manufactured goods of certain descriptions are unobtainable or difficult to procure suitable for South African requirements. Many British firms have very complete and highly efficient selling organisations in South Africa, and there has been a notable increase during the past five years in the number of visits paid to the country by directors and export managers of interested firms. There is still room for improvement, however, and trade is still being lost which could be retained by more efficient service. Much could be done by skilful propaganda to educate the buyer in the economy of paying for higher quality and durability, but what is wanted above all is closer study of the tastes, habits and needs of the market and better salesmanship, service and advertising.

Electrical and Allied Import Trade.

In 1927 the Dominion imported electrical plant, machinery, fittings and materials of all kinds (except lamps and telegraph, telephone and radio apparatus) to the value of £2,113,685. This is the largest figure yet recorded, and nearly twice the amount of the imports five years ago. The proportion contributed by the United Kingdom, 73 per cent., is satisfactory, although somewhat less than in the two previous years. The United States, with 14 per cent., and Germany with 7 per cent., were the most important of the other suppliers. Of the items separately recorded, that of batteries, both primary and secondary, is the least satisfactory, nearly two-thirds of the business, worth £180,000 in 1927, going to the United States and less than one-fifth to the United Kingdom. The position as regards motors has improved, the United Kingdom having obtained an increased share of a larger business. Transformers, on the other hand, have been obtained more largely from the United States and the Continent, the United Kingdom share in 1927 being only just over 60 per cent. British manufacturers are still supplying over 90 per cent. of the very large trade in cables and wires, although German firms are endeavouring to obtain a larger share, with some success. In heating and cooking apparatus, Canada has obtained nearly one-third of the trade, having had none three years earlier. Supplies from the United Kingdom, although not smaller in actual amount, form a much reduced proportion of the larger total. Electric lamps, not included in the total given above, to the value of £135,654, were imported in 1927. The value of those obtained from the United Kingdom was smaller than in either of the two previous years, although at 43½ per cent. of the total it is still the largest contribution. The importation of wireless apparatus shows no sign of recovery from the slump that followed the heavy over-importation of three or four years ago, and the value for 1927 was £45,533, as compared with £284,565 during 1924. The United Kingdom holds most of the trade, having supplied goods to the value of £37,408. Imports from the United States of America were £5,579, and from all other countries £2,546.

During 1927 the value of electrical material imported on Government account was £349,085, and of this the United Kingdom accounted for £305,926. This proportion of nearly 88 per cent. is considerably higher than in the case of commercial imports. Of the small remainder, Germany supplied the larger part and Switzerland most of the rest. Government imports of telegraph and telephone material were low at £93,663; of this the United Kingdom supplied £59,470 and Sweden £20,228.

Foreign Competition.

The report shows that the value of all imports from the United States has more than doubled since 1922. It is stated, however, that the increase in imports of American electrical machinery, plant and fittings has been small in proportion to the general increase. Upon the whole, competition from the United States does not appear to be growing, and the strength of the trade lies in a limited range of mass-produced articles and in certain special machinery and appliances.

Germany supplies low quality goods at very low prices which are well suited to the South African market, as its demand is generally for cheap goods irrespective of quality, but she is also well able to supply lines of superior quality at prices below those that can be offered by British firms, and she frequently uses the sales organisation built up to market the cheap bulk lines to introduce better and more competitive goods. Her sales organisation is usually very efficient. The actual value of electrical plant and material supplied by Germany in 1927 was £149,376

In Mr. Elmslie's comments on other foreign competitors no mention is made of electrical equipment. This is to be understood, as the particulars given above show that the United Kingdom, the United States and Germany were responsible for 94 per cent. of these supplies in 1927.

The Pacific Cable Board.

A Summary of the Year's Operations as revealed by the Annual Report.

THE annual report and statement of accounts indicate that the receipts (£397,730) for the year ended March 31st, 1928, exceeded the ordinary working expenses by £129,852. After taking account of the annuity of £77,544 payable to the National Debt Commissioners in respect of interest and repayment of capital, a surplus of £52,307 remained, of which £10,000 has been placed in the reserve fund; the balance, £42,107, less the amount in respect of interest on the capital outstanding accrued up to March 31st, 1928, is divisible between the partner governments in the proportions laid down in the statute. The traffic receipts (£387,046) fell short of those of the previous year by £80,017, due entirely to the entry into the telegraph field of a beam wireless service between the British Isles and Australia at lower rates than those of the cables. The loss was principally in the cheap classes of traffic, which are limited to plain language and subject to delay. The ordinary rate traffic was not seriously affected by the new competition. The expenditure (excluding the contribution to the reserve and renewal fund) was less by £32,140, partly due to retrenchment measures necessitated by the decrease in the business, and partly by automatic reduction of costs resulting from less work. Against the reduction there was increased expenditure of £10,000 in respect of the lease of a second landline across Canada, the contract for which had been made before the new competition was experienced. A committee, appointed by the Board in July, 1927, to report upon the prospects of effecting economies, made various recommendations which were adopted by the Board. The total assets of the reserve and renewal fund on March 31st, 1928, amounted to £356,735, and £7,554 was expended from the fund during the year under review in connection with the duplication of the cables between Vancouver Island and Fiji.

The cable between Norfolk Island and Auckland was interrupted from August 15th to September 3rd, 1927, and the Norfolk Island-Suva section from September 16th to September 30th, 1927, and again from February 18th to February 28th, 1928. None of the interruptions involved any delay or loss of traffic, and repairs in each case were carried out by the Board's cable maintenance vessel *Iris*. The other cables were maintained without interruption, and the landlines in Canada leased by the Board from the Canadian Pacific Railway Co. worked well during the year under review.

The Fanning Island staff has been largely reduced in consequence of modifications in the methods of operation. On Norfolk Island an outbreak of fire in July, 1927, due to an oversight of one of the Board's junior electricians, resulted in the destruction of the power house and of most of the machinery and plant. The building and plant were reinstated during the year under review at a cost of approximately £1,300. The Canadian repeater stations at Fort William (Ontario) and Calgary (Alberta) were closed on October 1st, 1927.

Some staff dissatisfaction, which took the form of petitions to the Board, was expressed as to the consequences of the economies which it was necessary to make to meet the altered circumstances of the Board's working; apart from certain minor concessions, the Board felt unable to authorise a complete staff reorganisation pending (1) a tour of the system by the chairman and an investigation of all local conditions, (2) the result of the Imperial Wireless and Cables Conference. As a consequence of the introduction of automatic apparatus, which requires less staff, and also of the reduction of traffic, the service was found to be largely overstaffed. Accordingly the training establishments at Bamfield and Sydney were closed down, and the students then in course of training disbanded; the surplus staff has been substantially reduced by resignations.

During the year approximately 9,200,000 words of international traffic (*viz.*, other than local messages between Australia, New Zealand and the Pacific Islands) were transmitted across the Board's system; this volume was less by approximately 2,800,000 words than that carried during the previous year. The ordinary or full-rate international traffic showed a reduction of approximately 220 000 words; deferred ordinary 269,000 words, daily letter telegrams 235,000 words, week-end telegrams 2,000,000 words, Government 60,000 words, and Press 53,000 words. There was an increase of approximately 40,000 words of deferred Press traffic. In addition, approximately 4,173,000 words were carried between Australia and New Zealand, and between those Dominions and the Pacific Islands; this was approximately 466,000 words in excess of the number handled during the previous year.

The Fuel Conference.—V.

Proceedings at the Sectional Meeting of the World Power Conference held in London.

Section M: Pulverised Fuel.

Mr. Archibald Page (chief engineer, Central Electricity Board), who presided on October 1st, said that when a new power station was being considered, or extensions of existing large stations were contemplated, the question which always came up for consideration now was whether pulverised fuel should be used. The issue was by no means simple and very often there was much at stake. Hence he looked forward to the discussion stimulating progress in the right direction.

Mr. H. A. Humphrey (vice-chairman of the Section) opened the discussion, after the reading of the general report. As consulting engineer to Imperial Chemical Industries, he had been responsible for the design of boiler plants capable of using over one million tons of powdered fuel per annum. No really good dryer had been devised for placing before the pulveriser, and fortunately the rational method of drying by hot air in the pulveriser itself was proving satisfactory. The increasing use of pulverised coal would focus attention on the moisture content of coal, so that it would never be allowed to rise above that point at which the coal could comfortably be dried in the mill itself. He believed the bin and feeder system would continue to be approved for really large and important installations, but he admired the way in which the inherent disadvantages of the direct-firing system were being overcome and believed there was a bright future for it. His company, after a very diligent search for the best pulverising plant, had adopted Raymond mills and Hardinge ball mills. The grinding plant was the least satisfactory part of the whole equipment, but improvements were rapidly being made. The dust emitted from pulverised-fuel fired boilers by way of the stack was a real difficulty; electrical precipitation involved very bulky apparatus and was expensive; dry cleaning only lessened the nuisance without curing it, but wet spraying into brick-lined chimneys offered a reasonable solution of the problem. He started his first plant with centralised grinding and creeper conveyors; later, the Fuller-Kenyon system of air transport was adopted in spite of its higher operating cost, but in the most recent plant, now under construction, he had reverted to creepers for such short distances as cross-connections required, but the mills were placed close to the boilers, each boiler having its own mill and bin, but any bin could feed any boiler. In combustion chamber design he had progressively used less refractory surface and more metal surface exposed to radiant heat. Although that construction might look expensive, it was not so if calculated on the actual heat transfer basis, because such exposed surfaces were extremely effective heat absorbers.

Mr. J. Burns said that for power stations he was much intrigued by the bin and feeder system because there must be a certain insurance against breakdown. At the same time, there were other methods of getting the same degree of safety, which was emphasised by the increasing number of users of the direct system.

Mr. H. G. Jenkins agreed that although the present position might not be regarded as one of discouragement, it was certainly a period for the exercise of discretion. A high standard of stoking had already been set up by mechanical stokers and that standard must be reached before pulverised-fuel firing practice could be said to be stabilised. For instance, the greater ability of the chain grate to lie with banked fires awaiting an expected peak load on the station was given to him as the reason, at one place, for a reversion to chain grates for some of the furnaces at a well designed station where pulverised-fuel plant was not only receiving fair usage, but also sympathetic trial on a considerable scale. The quarter of an hour needed to bring the boiler on in an emergency was the point of difficulty. The trouble to-day was the large demand made for space in the boiler department by most of the recent designs for pulverised coal plant, not only for floor space but also for height. The Duffield gyro furnace,* which had just been brought to his notice, seemed to have been a successful attempt to meet this difficulty, and the water wall had been avoided. The boiler had undergone a two years' full-scale works' test and 90 per cent. gross and 86.7 per cent. net efficiencies at the boiler had been reported. The boiler would very shortly be available for inspection in this country when some orders in hand for it were completed.

Mr. H. J. S. Mackay remarked that although to the uninitiated Mr. Rosencrants' paper would appear to be an impartial summing-up of the whole subject of pulverised fuel, in effect it was an apology for the failure brought about by endeavouring to apply American methods under English conditions. For a quarter of a century, those who had been responsible for the design of furnaces to consume English coal had been fully aware of the characteristic difference between American and English coal. His firm, like the author, had had unsatisfactory experience of the central system; having no illusions on the subject, it became essential, when forced into manufacturing and installing a system to be known as the Babcock, that it should not be a compromise, but clean cut and correct from the beginning. Therefore, they chose direct firing and dispersive short-flame burners, the Bailey wall construction of combustion chambers, improved ball mill pulverisers, and a completely new design. Moreover, he claimed that the system, although decried by Mr. Rosencrants, had been established successfully, was operating successfully, and he ventured to call it a modern system far beyond what Mr. Rosencrants described as a proposition stage on the drawing board. As regarded fuel conservation, pulverised fuel figures did not show much advantage. Moreover, in the case of the Birmingham and Derby power stations, an increase in generating costs had followed the adoption of pulverised fuel. Was it due to the type of plant installed, or had the cost of coal and labour increased? The issue seemed to resolve itself into the advantage of pulverised fuel firing in any particular plant. The dust problem, too, was a serious one in residential areas. However, the Davidson dust catcher would go a long way to solve that problem.

Mr. J. C. Twinberrow (Canada) spoke of the speed of the Calumet boiler fitted with Bailey walls and said that in one particular case the boiler was shut down at 10.30 p.m. and was started again at 7 a.m. the following morning, a period of only 10 minutes being required for the boiler to be delivering steam at the rate of 100,000 lb. per hour; the same boiler could be started from cold in 30 minutes. All water-wall installations on the Pacific coast were of Bailey construction. He made reference to the speed with which pulverised-fuel boilers at the Southern California Edison "Long Beach 2" station and at the Richmond (Philadelphia) station could be brought on to the line; they had been standing up to the most severe conditions. Good water-cooled furnaces incorporating a sufficient factor of safety were expensive, but the expense was warranted by the results.

Mr. E. K. Scott, referring to the beater pulveriser, suggested that it could be made more efficient by making the beater barrel tapered instead of parallel and arranging it so that the shafts carrying the beaters slipped one in the other, thus enabling wear to be taken up more easily.

Prof. G. I. Finch advocated the removal of the ash in pulverised-coal installations by electrostatic deposition, although he agreed it would be expensive.

Mr. F. D. Napier said that Mr. Rosencrants was so strong in his leanings towards the bin and feeder system that he had failed to notice a few serious errors in his list of stations using the one or the other system. For instance, the Taylor's Lane station of the North Metropolitan Electric Power Supply Co., the Liverpool power station, and Castner-Kellner's works, were all stated to be using the bin and feeder system, when in fact they were using the Fuller-Bonnot direct system. There were also some omissions of stations using the direct system. The Fuller-Bonnot system was a low-speed system and met most of the objections raised to the direct system by Mr. Rosencrants.

Mr. D. Wilson said there was little doubt in the minds of most engineers that it was more economical to burn fuel in the powdered than in the solid form; it was possible to produce powdered fuel plant at lower costs than mechanical stoker plant, whilst he contended that long before powdered-fuel burning became universal the dust problem would have been solved to everybody's satisfaction. The faint-hearted had referred to the troubles that had been experienced, but in this country alone plant had been installed representing one million sq. ft. of heating surface, and in America 10 million sq. ft. of heating surface. It was of particular importance at the present moment, having regard to the erection of new capital stations and to what Sir Robert Horne had said at the opening of the Conference, that they should expect the Government to insist upon the most economical system being adopted.

Mr. C. H. Sparks (Babcock & Wilcox, Ltd.) said that after the frank admissions of the author no one could doubt that the bin and feeder system had caused engineers to sift the wheat from the chaff, and the result had been the adoption at a rapidly increasing rate of the system which he had damned. The reaction taking place in favour of the directly-fired system was due to the great deal of bad experience and grief that had been experienced with the bin and feeder system.

Mr. H. S. Horsman also criticised Mr. Rosencrants's paper from the point of view of combustion chamber design. From the paper it would be seen that three of the furnace side walls were cooled by bare tubes and that the wall containing the burners was of refractory construction. That design was presented to the Conference as representative of modern practice, but it contained at least one obsolete feature, *viz.*, a refractory wall. In the ideal furnace the cooling arrangements, whatever they might be, should be disposed on all the walls in order that localised trouble might be avoided. He was also a believer in the protected tube (Bailey construction) because it could be arranged on all the furnace walls without unduly cooling the furnace.

* See Elec. Rev., April 16th, 1926, p. 609.

Commander H. W. Brooks (U.S.A.) at this point submitted the following resolution: "Whereas the papers and discussions presented before the session on pulverised fuel at the London Fuel Conference of the World Power Conference have convincingly demonstrated the need of both producers and users of pulverised-fuel equipment for some international understanding as to standards concerning (1) the sampling of powdered fuel; (2) the determination of its fineness (screen analysis); (3) the standardisation of sieves (at least in so far as to permit translation of sieving results from one standard to another); (4) the methods of testing pulverisers; and many other factors vitally concerning pulverised fuel measurement and testing; be it resolved that the International Executive Council of the World Power Conference consider ways and means which may lead to international co-operation of qualified technical and scientific organisations to the end of attaining mutual understanding of the points heretofore raised, as well as others similar, which may require consideration therewith; also that the Council thereupon order a report to be submitted to the second plenary meeting of the World Power Conference to be held in Berlin in 1930."

The resolution was put to the meeting and carried unanimously.

Mr. W. F. Carr-Hill (Bradley Pulveriser Co.) said that screen mills of the centrifugal type and ball mills and ball and mill tubes had pulverised during the past 30 years such enormous quantities of coal that he was surprised Mr. Rosencrants had made no reference in his paper to the very well-known fixed-screen type of mill. That type was being tried in power stations for boiler firing and was grinding coal to 85 per cent. passing 200 mesh at a power consumption of 12 kWh per ton ground, which showed considerable economy, compared with other types of mill fitted with pneumatic discharge referred to in the paper. Moreover, the cost of upkeep was from 1d. to 2d. per ton of English coal, which was much less than with the pneumatic discharge type. It was well known that the pneumatic type was more favoured in America because of the softer coal there. Any attempt to burn pulverised coal at all wet would result in pulverised coal becoming very unpopular in this country for power station work, but there should be no trouble in designing efficient dryers to meet English conditions of extra moisture in the coal. Waste-heat dryers had been successfully installed at a London power station, where the coal entered with about 15 per cent moisture and left the dryer with 2 per cent. There was nothing novel about it, as the same type had been used for years drying other materials than coal.

Mr. E. N. Taylor disagreed with Mr. Rosencrants as regarded the solution suggested of the moisture problem with the bin and feeder system. Excessive moisture in the raw coal gave trouble through the formation of a wet sludge in the pulverisers, but it had been successfully overcome by the admission of hot air, or gas, to the mill. The next problem was to prevent the moisture driven off in that way from attaching itself to the powdered coal, bringing about packing and arching in the storage bunkers and clogging the transport line. In the directly-fired system that trouble did not exist, but he could not share with the author the opinion that the problem as regarded the bin and feeder system was on the eve of solution. About a year ago Mr. Rosencrants told the Institution of Electrical Engineers that it was then on the eve of solution, but apparently the day had not yet arrived.

Mr. F. H. Rosencrants said he was more or less amazed at the amount of fire that had been drawn by what was intended to be a very innocent paper. He was a little disappointed that the discussion had been carried on to such an extent by makers of apparatus, and not more by users; actually five representatives of one firm had spoken. As regarded the statement that he had given credit to the bin and feeder system in certain cases when it should have been to the directly-fired system, all he could say was that the particulars had been sent round to the various firms for correction and as the firm concerned had not taken the trouble to send back corrections, the mistake had occurred; but it would be put right before final publication of the paper.

Section L: Utilisation of Fuels, including Electricity, for Domestic Purposes.

Dr. C. H. Lander (director of Fuel Research) presided at the meeting of this Section on October 1st, and the general report was read by Dr. Margaret Fishenden. In the capacity of vice-chairman of the Section, she opened the discussion, stating that in Great Britain every year 40 million tons of coal were used for domestic purposes; that amount had remained more or less constant for the last 10 years, and was equal to the highest reached before the war, being equivalent to 20 per cent. of the total home consumption. To dismiss lightly a consumption of that magnitude with suggestions for the complete, or sudden, abolition of existing appliances (which in Great Britain were the open grate and old-fashioned kitchen range) was rather precipitate. Development of that order of magnitude was bound to take time: the responsibility for pointing the easiest path of progress probably rested mainly upon fuel technologists, but unfortunately those paths were very often not at all clearly indicated even to the expert, for there was not only a very wide choice of fuels and methods, but one must also look forward to the products of processes which might possibly be developed in the near future. Again, what basis should be taken for comparison? However, they knew the working efficiencies of most types of domestic heating appliances fairly well; the great difficulty was to know how to apply them, and she therefore suggested that a census of requirements of domestic fuel would be very useful. Gas and electrical appliances in general were much more efficient than coal appliances, and they could also, for certain purposes, be equally cheap; but if an attempt were made to replace coal entirely by gas and electricity it would have, in general, a very serious effect on consumers' bills. Coal fires and solid-fuel appliances could obviously be greatly improved; gas was far cleaner and more convenient, and electricity (leaving out of account its high cost, both in initial fuel expenditure and to the consumer) could be regarded as almost ideal, but for economic reasons the day of solid fuel in the household was far from over. Fortunately, for some purposes, coke of suitable properties was an altogether satisfactory substitute for raw coal, and probably there would be room in the future for the development side by side of different types of carbonising processes, certainly to meet the needs of domestic requirements. At any rate, it seemed that the most immediate prospects for an improvement of the smoke nuisance lay in proper co-ordination of the use of gas, solid fuel, and electricity.

Mr. T. Carter (representing Mr. H. W. Clothier, of Messrs. Reyrolle & Co., Ltd.) said that when considering the use of electricity in houses the avoidance of risk of shocks from domestic electrical apparatus demanded very close attention at present. In British factories freedom from danger was already secured by the complete enclosure of all live conductors within metal casings, which must themselves be effectively earthed. The earthing of the framework of portable apparatus was compulsory in British factories, in accordance with the electricity regulations made under the Factory and Workshops Acts, but there was no corresponding authoritative rule to be observed when electricity was used in the home for cooking, heating, and other domestic purposes; yet there were many places in a house where the risks were precisely the same as in a factory, because of the presence of earthed metal. A change in present practice seemed to be imminent, and it might take one of two main courses: the first would be to insulate the framework of all apparatus completely, and the second would be to earth all exposed metal completely. To adopt the first suggestion would involve an entire upheaval in the design of the bulk of existing apparatus, and would not be satisfactorily accomplished without an enormous amount of research into suitable qualities of fireproof insulating materials. On the other hand, the complete and effective earthing of all exposed metal would require an intensive campaign to educate the great army of workmen, so that they would thoroughly understand the meaning of earthing and the serious consequences likely to arise from defective workmanship. It would be an advantage in an all-earthed system of the 3-core cable and 3-pin socket plug kind to provide an automatic announcement of a break in the earth circuit by some such method as the combination of the earth conductor with the house bell system, so that the bells would not ring unless the earthing system was intact. Particularly concerning domestic work it was important that attention should be drawn to the possible simplification of circuit-breaking devices for a.c. circuits, as distinct from d.c., if advantage was taken of the fact that a slow, short break was better than a quick break for alternating current, and allowed it to break with a negligible amount of arcing as it passed through zero. A slow break of 1/64th inch was entirely inadequate for 15 amperes of a.c. at 250 volts, and hence a protected-type plug of the British Standard pattern was better for opening such a circuit than an ordinary quick-break switch, because it utilised the characteristic of the circuit in respect of slow breaking to better advantage.

Mr. Velander (Sweden) referred to the efforts that were being made in Sweden to develop the electric cooking and heating and general domestic electrical load. He indicated one or two of the improvements that had been made in apparatus, and outlined the various forms of tariff that were being offered, which approximated very much to the ruling tariffs in this country.

Mr. J. W. Meares said that he, with others, had been hammering away for years in favour of domestic water electric heating as a means of increasing load factors and levelling load curves. That was a matter of overlapping, and involved some form of automatic control for switching off the water heating at peak-load periods. What was wanted, however, was a time switch which was within the means of the ordinary householder. People would not pay pounds for an appliance which was going largely to benefit the supply authority. He had seen an ingenious contrivance, involving the use of a cheap alarum clock, for automatically feeding chickens; something of the same sort ought to be available as a time switch.

Mr. Irwin Crookes (New Zealand) gave an interesting account of the development of the use of electricity for domestic purposes in New Zealand, and claimed that the facts there disproved the suggestion in Dr. Fishenden's paper that electricity was not used more for domestic purposes owing to high cost and other difficulties. In the area he came from, aggregating 300 square miles, with a population of about 250,000 people, within five years there had been installed 5,000 electric cookers and 6,000 electric water heaters, and that in competition with gas at 5s. per thousand cu. ft. and coal at about 40s. per ton. The charges for water heating were £1

per 100 watts per annum, with a minimum of £4; the water-heating supply was cut off between the hours of 4 and 6 p.m. automatically by a time switch installed by the supply authority free of charge. On the average, the cost per kWh worked out at about ½d. for the water heating. For ordinary domestic use the charge was 5d. per kWh for the first 16 kWh per month, 3d. per kWh for the second 16 kWh per month, and all above 32 kWh per month was charged at 1½d. per kWh.

Dr. E. W. SMITH contended that for the efficient heating of rooms it was necessary to have some form of radiant heat which would heat the walls and the furniture, they heating the air of the room. Radiant heat could be obtained very efficiently from electrical appliances, but unfortunately it was an expensive method, and the most important point, he felt, was to study methods of charging, both for electricity and gas. It was the fact that consumers of gas were being supplied with their gas at a price a great deal below the cost of production, and owing to the system of charging those consumers who were using gas largely for heating were paying for the use made of it by other consumers. If a proper commercial basis could be adopted, instead of an all-round flat charge, users of gas for heating would get it much more cheaply than they now did.

Lieut.-Col. W. A. VIGNOLES (director, British Electrical Development Association) said there seemed a tendency to ask for the sympathy of the public in favour of the gas industry, because of the extraordinary efficiency of the process of carbonisation and the large number of heat units obtained from the coal carbonised. That, however, was looking at the matter from a rather narrow point of view. What the nation and the collieries were more concerned with was that every ton of coal brought to the surface should be used. It must be recognised that only special classes of coal could be carbonised by the gas industry, and from the point of view that the electrical industry utilised low-grade fuels (which might otherwise be put on the dump heap) the electrical industry also deserved the sympathy of the public.

Capt. J. F. SHAW (Fuel Research Board), speaking of the pollution of the atmosphere, said a great deal needed to be done with regard to waste products from power stations.

Section P: Waste Heat Recovery.

Dr. C. MATSCHOSS (Germany) presided on October 3rd, and a general report summarising the papers presented on the subject was read.

Mr. E. C. EVANS (vice-chairman) said that the authors of the papers had at the outset struck the right note in pointing out that they were considering, not "waste" heat, but "surplus" heat. There was room for enormous improvement in regenerator design and in efficiency in high-temperature practice. After the problem of regeneration, or recuperator, efficiency had been solved, that of heat recovery by waste-heat boilers had to be faced, and already very substantial economies had been reported from a number of works in this country.

Mr. W. J. WILLIAMS (Chicago) gave particulars of plant provided by the Edge Moor Iron Co., of Delaware, U.S.A., for the utilisation of waste heat from gases from cement kilns, which had effected very great economies. Whilst the installations were rather expensive, he said, they had never failed to pay for themselves in less than three years, and there were instances in which the plant had paid for itself in less than a year.

Mr. TANSLEY (Great Britain) referred to experiments made by the British Cast Iron Research Association with the object of producing a cast iron to resist temperatures upwards of probably 1,800 deg. F., and he believed his firm had succeeded in producing a cast iron which was capable of resisting temperatures approaching that figure. He suggested that refractory materials should be used for the higher temperatures, and that for the lower temperatures they should be replaced by metals, which enabled one to accommodate a much larger amount of heating surface in a given space. With regard to feed-water heaters, he said that in the papers 230 deg. C. was mentioned as being the lowest limit to which the temperature of the gases could be reduced when leaving the boilers. During the past few years, however, it had been the practice to pass the gases through economisers and boilers at very much higher velocities than hitherto, with the result that a given duty could be obtained for a capital outlay of probably less than half as much as might have been necessary ten years ago. Therefore, he believed it would be possible to reduce the temperature of the gases to something like 120 deg. C.

Mr. E. F. SPANNER (Great Britain) said that waste-heat boilers had effected a great improvement in the fuel efficiency of motor-driven vessels. The thimble-tube Clarkson boiler appeared to combine the advantages of both the fire-tube and water-tube types.

Mr. H. J. FOUNTAIN said that the Clarkson waste-heat thimble-tube boiler had proved very efficient in extracting heat for steam raising from exhaust gases at temperatures even below 450 deg. F. The point was important because there was an impression that exhaust gases from two-stroke engines were of too low a temperature to be of value.

Mr. W. NEWTON BOOTH (Great Britain) said he had concluded that in many installations the cost of recovering waste heat might very easily exceed its value.

Mr. W. GREGSON (Great Britain) pointed out that it must be realised that there were fundamental regenerative limits, which were predetermined by the proportion of air to outgoing gases, and beyond that limit no amount of extra capacity or regenerative area would increase the efficiency. With regard to cast iron capable of withstanding high temperatures, he was perfectly satisfied so far as the higher-temperature ranges were concerned. What he was concerned about was the production of metals which would stand the action of very low-temperature gases, particularly those containing a large amount of sulphur trioxide. The reduction of the temperature of the gases leaving the boiler to 120 deg. C. was aimed at in the old days, but the results were appalling, because if one reduced the temperature to that extent at full load, at half or three-quarter load it was below the corrosive limit, and the economiser would be ruined in no time.

Mr. W. A. RILEY maintained that if waste-heat boilers were used, with auxiliaries attached, supplementary sources of steam should be provided to ensure continuity of working.

Mr. GREGSON suggested that Mr. Riley's policy was to carry caution to excess, and said he could speak of some six hundred plants which relied entirely upon waste heat recovery.

Section T: Training of Fuel Technicians; and Section V: Organisations Concerned with the Efficient Use of Fuel in Industry.

On October 3rd Sections T and V discussed jointly a number of papers, which were summarised in a general report.

Sir ROBERT HADFIELD, Bt., F.R.S., who presided, dealt with the necessity for research; it was most important for the fuel engineer to realise that unless more activity prevailed in fuel circles and the applied side of the subject (heat technics) it was quite probable that the electrical engineer would steal a march on the fuel engineer, notwithstanding the fact that the fuel engineer had first to assist the electrical engineer to get his power from fuel. In many cases it should not be necessary to go to the electrical engineer to get heat energy with which to carry out manufacturing operations.

The general report on the papers before Sections S (Power Alcohol), T and V was then presented.

Prof. J. W. HINCHLEY (vice-chairman) urged students who intended to become chemical engineers or fuel technicians to study chemistry when young, say, before the age of 21 or 22, because after that they were not capable of learning the array of facts and details which it was essential to learn before being able to take a sound chemical view of any problem; engineering, being of a more reasoning character, could be studied later.

Mr. J. ROBERTS said that the Conference had proved the immense value of the exchange of ideas, and it was for that reason that it was proposed to follow it up with a continual interchange of reports on research and developments. It was proposed to establish national and international bureaux of fuel publications, the object of which would be the distribution to its members of those publications on the particular aspects of coal treatment in which individuals were interested.

Mr. R. J. SARGANT (Messrs. Hadfield's, Ltd.), agreed that chemical studies must come first in the training of the fuel technician, with specialisation in physical chemistry. In any industrial organisation it was essential that there should be at least one member of the staff whose duty it was to control the fuel organisation of the works. "Refresher" courses for men who had been in industry for some years would be valuable.

Prof. C. PADOVANI (Italy) said that in Italy a national association for the control of combustion had been founded, and would deal with all thermal installations and give advice, whilst it would also be concerned with the training of men.

Mr. E. KILBURN SCOTT suggested that the training at universities and technical colleges failed because young men were not taught to express themselves, or to "think on their feet." Industry would be governed very largely in the future by conference and committee, and engineers must be trained to take their places on those committees.

Dr. F. S. SINNATT, commenting on the inadequacy of training facilities in this country, said that in contrast with our great capacity for using fuel, there were altogether only four professors and five lecturers on fuel in our educational institutions. The fuel technologists in the universities failed in their duties in not going out to find the problems of industry, and to solve them.

Mr. A. D. BAILEY (Chicago) endorsed Prof. Hinchley's view with regard to training in fundamentals, and said that those who were employing men in the United States were impressing that view upon the heads of the universities there.

Mr. F. S. GILLER urged that more attention be paid to the training and advancement of the artisans employed to operate boiler plant, ovens, furnaces, and so on, because those men had it in their power to lose more money in the course of a month through ignorance, or carelessness, than the designers had in their power to gain in a year. He had been profoundly impressed on many occasions by the terrible waste which resulted from placing beautifully-designed first-class plant in the hands of men who did not understand the principles on which it was designed and upon which it ought to be operated.

The Electrical Industry.

Some Considerations of the Economic and Industrial Aspects of the Subject.

By LIEUT.-COL. K. EDGCUMBE, T.D., R.E.T.(Ret.), M.I.E.E.

(Extracts from the Presidential Address delivered before the INSTITUTION OF ELECTRICAL ENGINEERS.)

IT is now generally agreed that the Institution cannot confine itself to the rigidly technical aspects of electrical engineering, to the exclusion of economic and industrial considerations.

The late Mr. Alexander Siemens, in his presidential address nearly 25 years ago, gave it as his opinion that "the progress of civilisation is in proportion to the cheapening of articles of consumption." If we assume that by "cheapening" Mr. Siemens referred to, not the quantity of such articles which a given sum of money would purchase, but the quantity which an average day's work would provide, we shall probably agree with him. "Real wages" are a measure of "the standard of living," and it seems reasonable to regard the standard of living in its turn as a measure of prosperity and therefore of the progress of civilisation. The possession by everybody of a large number of the good things of life entails their production in sufficient quantity; the more each man produces, the more there will be to divide up between him and his fellows. In other words, for a country to have a high standard of living it must have a high rate of production per individual; that is, high "productivity." To verify the truth of this conclusion, I have plotted in fig. 1, for 1925, the average output of manufactured goods per individual operative* in a number of countries, against the average "real wage"† ruling there (that is to say, the average hourly wage measured in terms of its food-purchasing power in that country). I did not anticipate such remarkable corroboration of my contention.

Productivity.

Comparing the relative productivity in British industries in 1907 and 1924‡ it may be said that whereas during the intervening 17 years the number of operatives in the electrical industry had increased by some 30 per cent., the total output (as measured in kind and not in money) only increased by some 25 per cent., so that production per head had decreased by about 4 per cent. In the staple manufacturing industries as a whole, it would appear that the output per operative had gone up by about 3 per cent. in the 17 years. Thus the annual output per head in this country has remained almost stationary during the last 20 years, so that it is hardly surprising that the standard of living still leaves so much to be desired.

If it is agreed that a high production per operative is desirable, what can be done to increase it? One of the most effective ways is to put at the disposal of each man as much mechanical power as he can usefully employ. There is plenty of room for improvement in this respect, and electricity affords the most economical and flexible means of applying such power.

Another of the most potent aids to better and cheaper production is research. That we in this country do not appreciate the benefits of research hardly applies to the electrical manufacturers, but they claim with some justice that it is the industry as a whole which has most to gain by research, and in particular by co-operative research, and that the industry has not in the past borne its fair share of the burden.

Much duplication and wasted energy can be obviated, not only in design and research but also on the commercial side, by rational co-ordination, whereby the resources and experience of a number of manufacturers are pooled and production restricted to such articles as each can produce the most efficiently. Of the various forms which "rationalisation" may take, the most advantageous is not the formation of gigantic and often unwieldy combines, but the loose coupling, so to speak, of a number of specialist manufacturers to one another and to a co-ordinating central organisation. Such an arrangement affords all the advantages of co-ordinated control whilst still giving free play to that elasticity and individual initiative which are so characteristic of the specialist firm, but so difficult of attainment in the "department" of a big concern.

Probably the most important factor of all is the aggregate output. The larger the national output, the larger is the amount which the manufacturers of the country can expend upon research and upon improved methods of manufacture. Comparing the electrical manufactures of the three chief competing countries, the national consumption is relatively much as follows:—Great Britain, 1.0; Germany, 1.6; United States, 5.0.

* The production per individual, which refers to heavy electrical goods but is probably typical of most other forms of manufacture, is taken from various sources, as given on page 20 of the monograph addressed to the Economic Conference of the League of Nations by the B.E.A.M.A. in 1927.

† Taken from "Survey of Industrial Relations" by the Government Committee on Industry and Trade, page 102.

‡ "Further Factors in Industrial and Commercial Efficiency" (Government Committee on Industry and Trade), page 5.

Oversea Markets.

In order to increase his output, the manufacturer naturally seeks outlets abroad. In this the electrical manufacturer has been particularly successful, having augmented the home demand by 25 per cent., or more, through oversea sales. At the present time Great Britain, Germany and the United States each furnish about a quarter of the world's electrical exports. It is, however, much more difficult than formerly to find oversea markets, owing to the fact that so many of the countries which used to import now manufacture the goods for themselves, and, in some cases, even export the surplus. This difficulty will undoubtedly increase as time goes on, so that it would seem to be to the advantage of the country to reduce to a minimum its *dependence* upon exports. As things are, however, our manufacturers must export, not only in order to maintain the volume of output necessary for economical production, but also in order to "keep their hands in," so to speak, by the manufacture of material for which the home demand is at present small, or even non-existent.

In order to export, it is necessary to sell at "overseas" competitive prices. Many people argue that there must be something radically wrong with the British manufacturer if he cannot produce as cheaply as his Continental rival, and that until he does so he deserves neither sympathy nor support. Such reasoning might be sound if the manufacturing conditions in all countries were the same, which is very far from being the case; conditions ruling in this country, however desirable they may be from other points of view, are unfavourable to cheap production.

Fig. 1 shows that the real wages of a country (that is to say, wages as measured by the commodities which they will purchase) were approximately proportional to the output per operative. From this it might be argued that the competitive

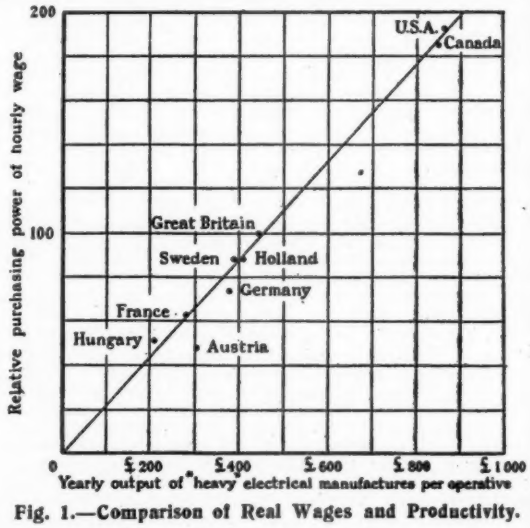


Fig. 1.—Comparison of Real Wages and Productivity.

power of all countries should be approximately the same, at any rate as far as labour costs are concerned. It must be remembered, however, that the figures for real wages represent the value of an average hour's wage measured in kind, but that this may be very different from its value converted into sterling, which latter is necessarily the criterion for us as regards competition in the world's markets. Again, the length of the working week on the Continent is, in general, greater than ours, the conditions of payment for overtime are less stringent, the proportion of skilled operatives is smaller, and so forth. The comparative position of Great Britain and Germany as regards production costs in heavy electrical engineering is shown in fig. 2.* The cost of manufacture in Great Britain is taken as £100, and the assumption is made that factory and commercial expenses are the same for each country. Imperial and local taxation accounts for about £5 in this country, as compared with about £2 in Germany; but taxation is cumulative in its effect and enters, at every stage, into every item of manufacture (labour, materials and overhead charges)

* From data supplied by the B.E.A.M.A.

in fact, it has been calculated that taxation in this country accounts in the aggregate for more than 20 per cent. of the total cost of production.

The British manufacturer has gone as far in the direction of research, standardisation, co-operation, rationalisation, &c., as his limited home market will admit and has but little to learn in this respect from other countries; but there often remains an awkward gap between his manufacturing costs and the price at which he must sell overseas, a gap which is only partially bridged by the superior, lasting and other good quali-

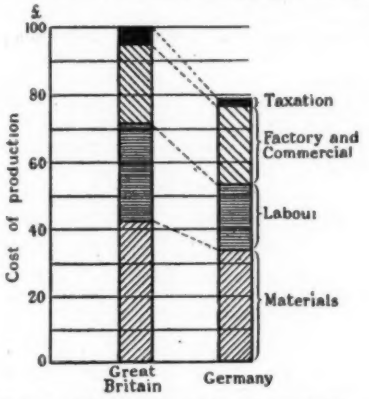


Fig. 2.—Relative Manufacturing Costs.

ties of his manufactures. On the other hand, unless he is in a position to obtain export orders, his output will suffer and his manufacturing costs will be still further increased; it is a vicious circle.

Minimum Selling Price.

The only way out of this *impasse* is to sell at a lower price abroad than at home, thus maintaining an average price corresponding to the manufacturing cost. It might be thought that this would mean a higher price to the home consumer, but the following considerations will show that the opposite is the case.

In general, the manufacturing cost is made up of two parts, one proportional to the output and the other more or less constant for wide variations in the output. The relative values of these two factors differ greatly according to the industry, but, as a case in point, we may assume that, of the total cost of production in a certain department, or works, 80 per cent. is proportional to the output and 20 per cent. is fixed; fig. 3 shows this graphically. The home demand is assumed to be 1,000 articles in a given time, and the cost of producing them £100 each. If the price obtainable overseas is only £80, the cost price is well above such a selling price, for all reasonable quantities. If, however, the manufacturer decides to take his courage in both hands and to sell abroad at that price, it will be seen from fig. 3 that not only is he able to do so, but he will also be in a position to reduce his home price by an appreciable amount, whilst still maintaining the requisite average price. This is shown by the sloping straight line marked "home price." For example, if he sells 500 articles abroad in addition to the 1,000 sold at home, he can reduce his home price by 5 per cent., whilst still selling abroad at £80.

But there are people, and amongst them some who ought to know better, who look upon such averaging as immoral. They are under the impression that unless home and overseas prices are exactly the same they are being swindled, quite ignoring the fact that increased sales afford a means (and often the only means short of lowering wages) whereby prices can be reduced. Personally, I see in such averaging, not immorality, but arithmetic. We are quite accustomed to averaging in other directions; for example, the whole method of charging by the Post Office is based upon it.

Curiously enough, the very people who are so scandalised to find that a manufacturer has quoted them a higher price than he has quoted abroad, are often equally scandalised to find that two, or more, manufacturers have quoted them the same price at home. They proclaim that free competition has been destroyed by a ring and that "tendering has become a farce." Such arguments are now seldom heard, since it is very generally recognised that there are two forms of competition, price and quality. To sell at or below cost is a nefarious practice which ought to be forbidden by law.

Unemployment and its Cause.

A phenomenon which is having a profound influence upon the well-being of the country is abnormal unemployment. We have become so accustomed to see, month by month, that the number of unemployed has gone up or gone down by a few thousands that there is a real danger of our looking upon a million, or so, as a normal condition. If we contrast the unemployment figures of the last five or six years with comparable pre-war figures, there would appear to be a permanent "surplus" of at least 800,000 persons.

Prof. Pigou, the eminent economist, has propounded the interesting theory* that the present abnormal unemployment is due to the artificial forcing up of the wage of the manual worker, particularly of the unskilled manual worker, to a level which is too high, having regard to the existing openings for employment. The remedy, short of reducing wages, is to increase productivity to such an extent that the return per unit wage is restored to the economic level, an effective way of doing this being to increase the total output so that more intensive methods of production can be employed. In the United States the output per operative is said to have increased by 40 per cent. since 1914, and yet the number of operatives to have increased concurrently by 20 per cent. It would appear that under-production can be quite as much to blame as over-production. In fact, if Prof. Pigou's explanation is correct, under-production, not necessarily per individual, but per hourly wage paid, is wholly responsible for it. Unemployment is not a symptom that commodities as a whole are being over-produced, or under-produced, so much as that they are being produced in the wrong relative quantities from the point of view of consumption. If free play were given to the effects of supply and demand, equilibrium would be restored, automatically, within a reasonable time; but, under modern conditions such free play is impossible, so that some other remedy must be applied.

If this diagnosis is correct, the remedy is clearly either to reduce the output of some commodities, or to increase the output of others; that is, to level down, or to level up. Although each method might be equally effective as regards employment, it must be remembered that levelling down production means "short time," increased prices and, in fact, a lower standard of living all round. Levelling up, on the other hand, means raising the standard of living, and two things are necessary, a transference of operatives from the less active to the more active branches of industry, and concurrently a general increase in the country's trade. Is it possible to secure this extra trade and so give the required initial stimulus? The answer must depend upon what additional output of commodities would be involved in the re-absorption of the present surplus of 800,000 operatives.

If we assume an average wage of 45s. per week, the earnings of 800,000 would be about £90,000,000 per annum. At least 65 per cent. of the cost of any article goes either directly or indirectly in wages, using the term in its broadest sense; therefore, a wage bill of £90,000,000 would correspond to a selling price of £140,000,000. If the country's output of manufactured articles were increased by £140,000,000 per annum, some 800,000 operatives could be re-absorbed and the unemployment problem would be practically solved.

Stimulus Essential.

As far as concerns the capacity of manufacturers to turn out the goods, no difficulty would be experienced, since the majority of the factories of the country are at present working far below their efficient capacity. The problem is to find a market. As regards oversea trade, in face of the difficulties I have already enumerated, there does not seem to be any prospect of material expansion, and we are therefore left with the home trade. The consumption of the country cannot be suddenly expanded, but of the manufactured goods consumed in the United Kingdom about £320,000,000 worth are made abroad. Of these, it seems reasonable to suppose that at least half, or £160,000,000 worth, could be equally well made

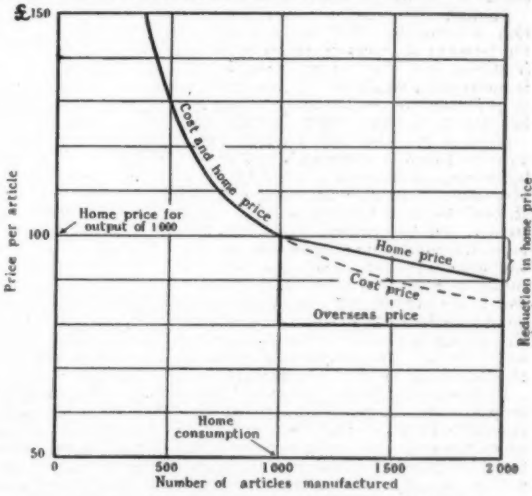


Fig. 3.—Selling Price as Affected by Output.

here; but we are only looking for a market for £140,000,000, so that this would seem to provide the required solvent for the country's surplus labour.

I cannot help recalling a remark made to me many years ago by a wise old man who said: "Remember this; in the long run, what you pay for is what you will get." An objection which will be raised is that the finished product of manufacturer A constitutes the raw material of manufacturer B, and that if the latter has to pay more for his raw material he will have to charge more for his product, which may jeopardise his

* *Economic Journal*, September, 1927, p. 355.

overseas business; too much has been made of this argument. In the first place, the extra cost spread over all purchases amounts to about 2d. in the £, or, say, one-third of 1 per cent. on the average cost of the finished article. In the second place, the extra volume of business which A obtains from B will very materially reduce his manufacturing costs and so enable him to lower his prices to B; whereas, so long as B imports his requirements it is impossible for A to reduce his prices sufficiently to enable him to compete with foreign quotations.

I shall probably be told that my proposal simply will not work because, imports being paid for by exports, any reduction in imports must be accompanied by a corresponding reduction in exports, and that consequently the effect will be, not to increase employment, but merely to transfer labour from export orders to home orders. I would reply that to regard exports as desirable in themselves is really to put the cart before the horse. We are compelled to import raw materials and food to the extent of some £500,000,000 annually, and these must be paid for by exports. If we import anything further, it is not a case of helping us to export, but of compelling us to export in order to pay for these further imports.

Moreover, rates of exchange are not dependent solely upon the difference between exports and imports; at present other factors to be considered are reparations payments, loans repayment, foreign investment, &c. Taking this last item alone, we are at present investing abroad from £50,000,000 to £100,000,000 per annum less than we did before the war (allowing for the change in the value of money). Overseas investments tend to increase our trade and might thus be used to advantage to balance two-thirds of the proposed reduction in imports. The increased purchasing power of the 800,000 people now for the first time becoming producers, instead of being mere consumers of the dole, would go far to balance the remainder.

(To be concluded.)

Rural Electrification.

A review generally of the position in this country and in particular in the Chester Area.

By S. E. BRITTON, M.I.E.E.

(Abstract of Chairman's Address read before the MERSEY AND NORTH WALES (LIVERPOOL) CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE development in electricity supply in this country is now such that rural communities are entitled to a supply at least equal to that which was given to some large towns in the country thirty years ago. It is open to anyone to make application to the Minister of Transport for a special order to authorise the distribution of electricity in a defined area; in return for such powers obligations are imposed upon undertakers to provide distributing lines and to afford a supply of electricity. The undertakers must within two years after the date of commencement of the special order provide and maintain suitable distributing lines for the purpose of a general supply in the streets specified in the order.

The erection of overhead lines is subject to regulations prescribed by the Electricity Commissioners for securing the safety of the public. The conditions imposed by the regulations have a material bearing upon the extent to which rural electrification can be economically developed. A revised code has been made during the year which came into use from April 16th, 1928, and materially assists the development of rural electrification. Still further relaxation is necessary to enable the supply to be extended to the utmost limit.

What is meant by rural electrification? It should mean the provision of a comprehensive system of transmission and distributing lines over an extensive rural area very much like the telephone with its trunk and subsidiary lines; but with this important difference—the system should be designed to supply complete electrification of homes, businesses and industries, and a greater percentage of premises than the telephone system can ever hope to serve.

The total area of England and Wales is 58,340 square miles, of which 6,500 square miles is scheduled as urban area and 51,840 square miles as rural area. Of the rural area 29,350 square miles, having a population of 5,468,514, is included in areas of supply, and 22,490 square miles of rural area, having a population of 2,383,768, is not within the area of any distributing authority.

In fairness to electricity supply authorities it should be stated that the conditions associated with rural electrification justify to a considerable extent the indifference and lack of enthusiasm shown towards this branch of electricity supply. The problem involves ways and means of providing economic systems of supply, the alternative methods of dealing with rural areas being: By existing undertakers obtaining statutory powers to extend into adjacent areas; or by setting up additional statutory authorities to supply in areas not already electrically occupied.

There cannot be two opinions as to which of these two methods is capable of producing the most economical and satisfactory service. In the first case there is the organisation and facilities of established undertakings, with their financial and technical resources and mature practical experience; in the other there is no establishment with which to share the initial burden inevitably associated with development.

It is essential that a provision should be added to the Electricity (Supply) Acts to enable undertakers to adopt a tariff formula based on services offered, co-ordinated with the expenditure to provide and maintain the service under different conditions and circumstances and with the ability of potential consumers to pay. The adoption of such a formula should be obligatory upon undertakings and be the basis of supply to consumers.

In my own area it appears that farm employés occupying houses having from two to four rooms, and assessed at from £3 to £6, spend from 30s. to £3 per annum on candles and oil, and from £7 to £12 on fuel; other classes of rural inhabitants occupying houses having from three to seven rooms, assessed at £5 to £10, spend from £2 to £7 on light and from £6 to £25 on fuel, and farms spend on these services, including power, from £8 to £140 per annum.

It has been ascertained from consumers who formerly used oil-driven electric lighting plants for lighting purposes only that the running and maintenance costs amounted to from £20 to £100 per annum, according to the size and requirements.

An attempt has also been made to obtain the order of merit placed upon the various applications of electricity for domestic, business and farming purposes; the result is as follows, in the order given: Lighting equipment, motors for barn machinery, irons, fires, motors for dairy use, motors for pumping, cooking appliances, vacuum cleaners, fans, wash boilers, washing machines, and water-heating apparatus.

The electrification of the Chester area began in 1924, and the supply is now available in 52 out of 95 parishes. At March of this year there were in use 25 miles of h.p. overhead transmission lines, 23 sub-stations, 36 miles of l.p. overhead lines, and 7 miles of underground cables supplying 1,459 consumers. The consumers represent 40 per cent. of the occupied premises along the route of the distributing lines and 21 per cent. of the whole of the premises in the area.

Three-phase current at 6,600 V is taken into the rural area by three overhead transmission lines, and transformed to the standard voltage of 400 between phases and 230 between phases and neutral and distributed on a 4-wire system.

The capital expenditure at March, 1928, amounted to £46,732, which represented £687 per mile of high- and low-pressure lines, and £1,087 per mile of l.p. lines, £34 per consumer, £6.74 per premises, £6.62 *per capita* and 1s. 1d. per unit sold.

The income for the year amounted to £10,064, and represented £148 per mile of high- and low-pressure lines, £244 per mile of l.p. line, £6.898 per consumer, 28.5d. *per capita*, 2.802d. per unit sold and 21.5 per cent. of the capital expenditure. The units sold amounted to 861,926, and represented 12,675 per mile of high- and low-pressure lines, 20,045 per mile of low-pressure line, 590 per consumer and 122 *per capita*.

In considering these financial and statistical particulars it should be remembered that much of the capital expenditure was in respect of a transmission system into parts of the district not yet served. This is therefore a burden on the undertaking during the development period. It should also be remembered that there remain 60 per cent. of the premises not connected, and when saturation is reached the income will probably be increased by approximately 100 per cent.

Electricity is offered to all classes of consumers for all purposes on a two-part tariff at a fixed charge of 20 per cent. per annum on the ratable value of the premises, plus a unit charge of 1¼d. per unit, or in the alternative a flat rate of 7½d. per unit for lighting, 1¼d. per unit for cooking and heating, and 2¼d. to 1½d. for power purposes.

In order to ensure the rural supply being remunerative a guarantee is imposed upon each consumer with the object of obtaining an income of at least 20 per cent. of the expenditure, the method employed being the allocation of a sum which represents 20 per cent. upon the estimated cost of an extension between the occupiers of the premises in proportion to the ratable value of the premises which come within reach of the supply. By the adoption of this method, guarantees as low as 4s. and as high as 15s. per £1 of ratable value have been asked for and accepted.

An important advantage of this method is that the minimum payment required is usually in advance of the cost of the quantity of electricity a consumer would use for lighting, and a consumer, rather than pay the undertaking what appears to him to be money for nothing, purchases electrical apparatus to enable him to consume electricity to the full value of the guaranteed amount, and thus the electric habit is developed, with the result that frequently the value of the consumption exceeds the guarantee.

This attempt at rural electrification has created a considerable market for the sale of agricultural land bordering the streets where the supply is available. It has helped many who have helped themselves to obtain the service of electricity. It has influenced the building of about 300 houses, it has induced a number of families to move into the country and other families to come into the district. It has created new rural industries and revived others which were flagging, and it has increased employment amongst communities.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Battery Switchboard.

Messrs. H. A. McQUEEN & Co., LTD., 182, West George Street, Glasgow, who have recently added to their business by building a factory for the production of high-class switchgear, have brought out a new type of semi-automatic enclosed

Fig. 1.—Battery-charging Switchboard.

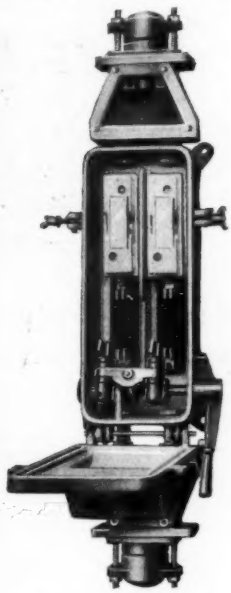


Fig. 2.—Watertight Switch-fuse Unit.

ironclad battery switchboard, fig. 1, in which all battery charge and discharge switches and knife switches have been done away with. The essential functions of the battery-charging plant are all controlled by one rotary-type switch. In addition to this switch, the board is equipped with the necessary instruments, cut-outs and fuses, regulator, and other auxiliaries.

An Earth-leakage Transformer Relay.

Incorporated in a scheme of remote control for coal face-mining machinery recently introduced by Messrs. EDWARD

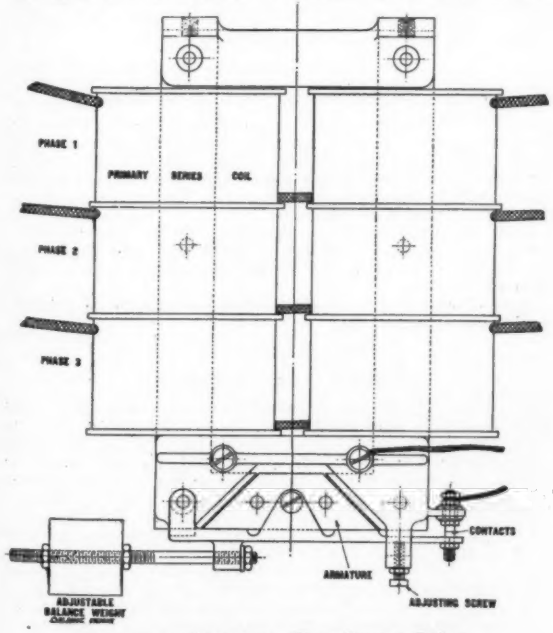


Fig. 3.—Earth-leakage Transformer Relay.

HOLME & Co., LTD., Moss Lane, Altrincham, is an earth-leakage transformer relay which, it is claimed, is an entirely new departure in that, instead of utilising an induced current, the flux in the transformer itself is employed. This, it is claimed, leads to higher efficiency, as no intermediate relay is used, and there is, therefore, no impedance to overcome in the relay magnet. It also tends to lower the tripping value so that the relay will operate on a leakage current as low as 1 A, this value being independent of the nature of the load and in no way related to it. The relay is very robust, and no delicately balanced instrument is used, so that it can be handled quite roughly without fear of damaging the mechanism. Further, owing to its robust character, the relay can be manufactured cheaper than the usual type of earth-leakage relay. Where necessary, the coils can be compound filled, leaving the tripping mechanism exposed and free for adjustment. Fig. 3 shows the general arrangement of the apparatus.

New Watertight Switchgear.

The accompanying illustration, fig. 2, shows open a new watertight switch-fuse unit which has been introduced by Messrs. HEYES & Co., LTD., Water-Heyes Electrical Works, Wigan, and in which an improvement in the design of the air-break switchgear is adopted. The operating spring of the switch is only in tension when actually being operated, thereby always ensuring a quick and efficient break. There are two breaks per pole and ample contact area is provided. These, combined with the new movement, form a switch capable, it is claimed, of interrupting the comparatively heavy currents which are sometimes required to be dealt with. Arc shields are fitted between poles, and the fuses are of an easily re-wirable type. The whole is housed in a cast-iron case with a fully interlocked cover. Two- or three-pin and earth-pin plugs and sockets may be fitted to form a unique design of switch-fuse plug. The switches may also be built up into distribution panels suitable for use on two-, three- or four-wire systems, with d.p. or t.p. switches. They are made in standard capacities up to and including 200 A for medium-pressure systems.

Hand-painted Shades and Bowls.

Messrs. JOHN SHAW & SONS, WOLVERHAMPTON, LTD., Wolverhampton, have recently introduced a particularly attractive range of hand-painted electric light shades and bowls. These comprise new designs, both from the points of view of the paintings and the actual shades. It is claimed that the glass-

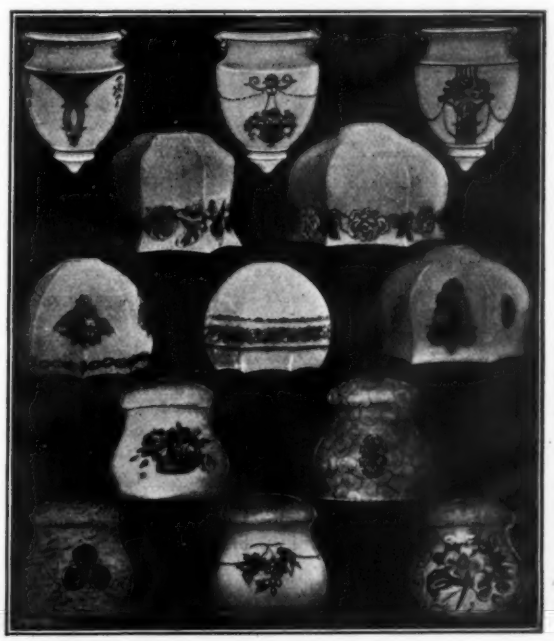


Fig. 4.—Hand-painted E.L. Shades.

ware is of the finest quality. Fig. 4 shows selections from the range; unfortunately, these are shown in black and white, while an important feature of the products is the colouring. The top three shades, which are of the inverted type, are fitted with special easy-grip holders for instant fitting to the lamp socket.

The Dairy Show.

Electrical Features of the Exhibits.

THE annual Dairy Show of the British Dairy Farmers' Association was held at the Royal Agricultural Hall, Islington, last week. While there seemed to be little if anything really new in the electrical equipment, the exhibition as a whole was very encouraging, both because the electric drive was used in almost every case for motive power, and because of the evidence that the "electric idea" had gripped the dairy people. The advantages in the way of cleanliness of electrical equipment in the dairy are so overwhelming that ordinary questions of running costs are hardly considered.

The following brief particulars of some of the exhibits may be of interest.

A large number of bottle-filling and disking machines were on show, all electrically driven, and in many cases embodying the "built-in" principle. Messrs. Graham-Enock Manufacturing Co., Ltd., showed a bottle-filling and capping machine designed to deal with 2,100 bottles per hour and equipped with a ¾-h.p. motor. The motor is of the totally-enclosed type and finished, in common with the rest of the machine, in white enamel. A similar machine was shown by Messrs. Arthur G. Enock & Co., Ltd., but with the motor covered over completely by means of a watertight hood. This arrangement allows the machine to be washed down by means of a hose pipe. Suitable arrangements are made for the ventilation of the motor from under the machine platform. Fig. 1 is a view of this machine. It is very interesting to note that for an increase of only ¼ h.p. in the motor size the capacity of the machine (suitably designed, of course) is increased to 4,000 bottles per hour. A large rotary can washer was shown by this firm driven by a 10-h.p. motor. Each can is subjected to six successive washings and finally dried with air at 230 deg. F. The apparatus will deal with up to 360 cans and lids per hour.

Messrs. H. W. M. Hiron & Co. showed a steam-heated 500-gal. pasteurising plant equipped with a 1½-h.p. motor for providing the necessary milk circulation. The short chain drive with which the equipment is fitted is said to be quite a new departure for this class of apparatus and to give excellent results.

Messrs. T. Hall & Sons, Ltd., showed some interesting selections from their range of refrigerators, which covers machines capable of dealing with from 25 to 500 gal. of milk per hour. One item was a combined cold-storage and milk-cooling apparatus designed to deal with up to 50 gal. per hour, with 150 gal. in store. This is usually equipped with quite a small motor of about 2 h.p. Another similar, but smaller,

Fig. 1.—Electrically-driven Bottle-filling and Disking Machine.

combination which was seen on this stand, is intended primarily for use in retail shops and is equipped with only a ¼-h.p. motor.

The "Hallmark" milk-cooling outfit, fig. 2, was shown by Messrs. J. E. Hall, Ltd., working in conjunction with a direct expansion milk cooler. This apparatus is equipped with a ¾-h.p. motor and will deal with 25 gal. of milk per hour. An ammonia refrigerating unit also seen on this stand will deal with 40 gal. of milk per hour continuously. It is operated by a 1½-h.p. motor. By running the machine previously and storing up cold, it can be made to deal effectively with 100 gal. in the first hour's run. An interesting feature of this display was a large refrigerator designed to deal with 2,000 gal. of milk per hour. This machine requires a 40-h.p. motor to drive it.

Messrs. Electrolux, Ltd., had their usual display of refrigerating plant, cabinets, and so on, and Messrs. R. A. Lister & Co., Ltd., showed their usual comprehensive range of cream separators, many of which were electrically driven.

The Alfa-Laval Co., Ltd., exhibited a complete "Alfa-Laval" milking installation capable of dealing with up to 20 cows. A 1½-h.p. motor drives a rotary pump which supplies both the vacuum and compressed air necessary for the

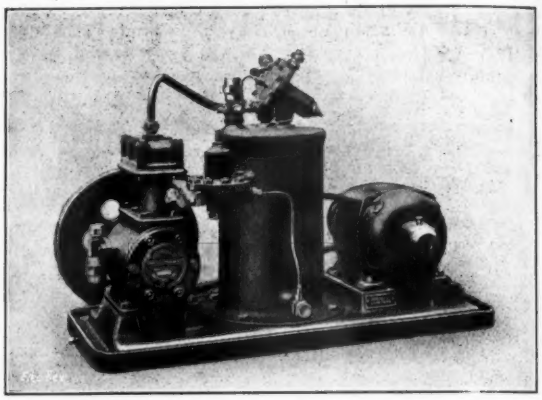


Fig. 2.—Milk-cooling Outfit; 25 gal. per hour; ¾-h.p. Motor.

alternating pulses on the suction equipment. The pulsations are all centrally controlled and not from the units. Here, again, is an instance of a very large increase in machine output for only a slight increase in the size of the electric motor. With a 2-h.p. motor installed, as many as 40 cows can be dealt with on the same equipment; the pump speed is increased from 375 to 500 r.p.m.

Legal.

Accumulatoren A.G. v. Tudor Accumulator Co.

THE *Financial Times* reports that on October 23rd the Anglo-German Mixed Arbitral Tribunal heard two claims by the Accumulatoren A.G. (an affiliated company of the respondents) against the Tudor Accumulator Co. Dr. Behl said that the first claim was on behalf of four German directors of the respondent company for remuneration for 1913 and up to August 4th, 1914. For 1913 a sum of £1,680 was allocated for the remuneration of five directors—the claimants and a British director. The second claim was for the sum of £944 in respect of royalties; in this case the parties agreed upon a basis of settlement. The Tribunal decided in the first case that the four claimants were entitled to four-fifths of the sum claimed, namely, £1,344 plus interest, together with £30 costs.

Celebrity Gramophones, Ltd., v. Celebritone, Ltd.

MENTION was made to Mr. Justice Clauson, in the Chancery Division on October 26th, of a motion by Celebrity Gramophones, Ltd., against Celebritone, Ltd., described as wireless, electrical, gramophone, and sound synchronisation manufacturers, which was stated to be a motion to restrain the defendants from trading in that name.

Both Mr. SPENS, K.C., for plaintiffs, and Mr. GREENE, K.C., for defendants, said they had received evidence which they wanted to answer, and they wanted the matter dealt with as soon as possible.

In the circumstances, his LORDSHIP assented to an adjournment until October 30th.

"Alkum" Electric Batteries.

MR. JUSTICE MAUGHAM, in the Chancery Division on October 26th, decided a legal point raised in an arbitration between Worsnop & Co., Ltd., described as the vendors, and Louis de la Garde, the purchaser, of the goodwill, patents, trade marks, and registered designs relating to the venders' business in the manufacture and sale of "Alkum" electric batteries.

Mr. SWORDS, for the purchaser, said that the arbitration arose out of an agreement between the parties relating to the sale of the business referred to. A clause in the agreement provided that "the agreement is subject to a condition that the tests which are now being carried out by or on behalf of the purchaser prove to his reasonable satisfaction that the Alkum electric batteries now being made by the vendors are capable of fulfilling the claim made by them." In Counsel's submission from the interim findings of the arbitrators they had in fact held that there were no tests being carried out, and the effect therefore was that it could not be proved to the satis-

faction of the purchaser that the batteries were capable of fulfilling the claim made, and the whole contract was at an end as a result.

Mr. HUNT replied for the vendors.

Mr. Justice MAUGHAM, giving his decision, said there was no evidence to show that the tests were being made; yet the vendors were entitled to rely on the agreement unless and until it was affirmatively established by the purchaser that the tests which were being carried out were unsatisfactory. It was the opinion of the Court that the contract was not by reason of the findings of the arbitrators, unenforceable against the purchaser.

Claim for Electrical Work.

JUDGE THE HON. W. B. LINDLEY, at Tiverton County Court on October 24th, heard an action by Messrs. H. Pincott & Sons, electrical engineers, Tiverton, against Mr. Robert Molesworth, of Putney, trading as the Palmerston Hotel, Tiverton, claiming £96 for goods sold and work done. The defendant counter-claimed for £250 damages for alleged faulty workmanship.

Mr. PENNY, for the plaintiffs, said that in 1925 Mr. Molesworth instructed Messrs. Pincott to install an electric lighting plant in the Palmerston Hotel. Mr. Pincott advised a 100-V plant, but Mr. Molesworth said that a 50-V plant would be sufficient. This was installed, and paid for. Two years later Mr. Molesworth told Mr. Pincott that he wished to increase the power of the plant. The latter saw the installation and found the batteries in a poor and neglected condition. He again recommended a 100-V plant and a new dynamo. Mr. Molesworth decided to have 25 V added and to use the same dynamo. No complaint was made until Mr. Pincott tried to get his money; there was then a suggestion that the case should be submitted to arbitration.

Mr. TEMPLEMAN, for the defendant, said that the workmanship was bad. The dynamo had constantly to be overloaded, and in February of this year an expert declared the installation to be useless. Mr. Molesworth had had to spend £90 on having the wiring put right. He had now changed over to the town supply, and had lost nearly £400.

Mr. B. WYE, manager of the Palmerston Hotel, said that the dynamo had constantly to be over-run; he denied that the batteries were neglected.

Mr. F. W. GUNN, of Messrs. Stenner & Gunn, electrical engineers, Tiverton, said that the installation was inefficient from the first. The battery was too small, and the dynamo was inadequate. The switchboard and battery were badly installed. There was no evidence of mismanagement of the plant. He admitted that not all the workmanship was bad.

Mr. C. LYE, electrical engineer, Exeter, said that the original installation was on the small side for a hotel. Witness criticised the workmanship, and said the price of the job showed that it was a cheap one.

For the plaintiffs Mr. PENNY said that additions had been made, and plaintiffs refused to be responsible for the installation. The job was a cheap one, and the cost had been cut down from the beginning. If the defendant was so disgusted with the work done, it was strange that he should have asked plaintiffs to install extensions. Mr. W. PINCOTT said that he advised a larger plant, but Mr. Molesworth said he could not afford it, and took the risk of adding 14 cells to the original 50 for which the dynamo was wound. The installation had been tampered with. Witness ascribed the condition of the cells to overloading and not charging properly.

Mr. A. J. HOWARD, electrical engineer to the Taunton Corporation, considered the whole trouble was due to incompetent supervision, a contributory factor being that a 75-V battery was charged by a 50-V dynamo.

The JUDGE said that the job was a cheap one, and defendant had tried to overtax it. He found for the plaintiffs on the claim, and dismissed the counter-claim.

B.T.-H. Irish Litigation.

IN the Dublin High Court on October 23rd, Mr. Justice Meredith heard an action in which the British Thomson-Houston Co., Ltd., were plaintiffs; Litton & Co., Ltd., defendants; and Etablissements de E.C.A. Grammont (Société Anonyme) third party.

Mr. MARNAN, on behalf of the plaintiffs, who claimed patent rights in certain filament lamps sold by the defendants, tendered a consent in the action agreed to by all the parties, and asked to have it made a rule of court. The consent provided—(1) that the plaintiffs should be entitled to a perpetual injunction restraining the defendants and their agents from infringing the plaintiffs' letters patent No. 23775 of 1912, and No. 10918 of 1913; (2) that the defendants should within a week from the entering of judgment deliver up to the plaintiffs all lamps in the possession or control of the defendants made in infringement of the letters patent; (3) that all claims by the third party against the defendants were abandoned and withdrawn; (4) that all further proceedings in the original action, or on foot of the third party notice, should be stayed, and that the plaintiffs and the defendants and third parties, respectively, should abide their own costs other than the costs already paid. Mr. Justice Meredith made the consent a rule of court.

British Thomson-Houston Co., Ltd., v. Ogus.

IN the Chancery Division, on October 26th, Mr. Justice Maugham heard a motion on behalf of the plaintiffs for an injunction to restrain until trial Mr. R. Ogus, Beaumont Square, Mile End, E., from infringing their gasfilled lamp patent.

Mr. G. W. TOOKEY, for the plaintiffs, said that he believed the application was not to be contested, and that the defendant was ready to treat the motion as the trial and to consent to an order in the terms asked for.

Mr. WHITEHEAD, for the defendant, agreed, and said he would submit to an order for injunction and an inquiry as to damages, delivery-up of the infringing articles, and payment of the taxed costs as between solicitor and client.

His LORDSHIP made an order accordingly.

Marconi Action Postponed.

MR. JUSTICE ROMER, in the Chancery Division on Tuesday, October 23rd, heard an application by Mr. Corsellis to take out of the term's list the action, Marconi's Wireless Telegraph Co., Ltd., *v.* Economic Electric Lamp Co., on the ground that an important witness was in Austria.

His Lordship granted the application on an undertaking that Mr. Justice Maugham would be asked to take the case when he took the witness action list next term.

Fraudulent Consumption of Electricity.

AT Consett (Durham) last week Elizabeth Hickson, Bute Street, White-le-Head, was fined £2 for fraudently using electricity belonging to the Tanfield Urban Council. The Council's electrical engineer, Mr. C. WEDDERBURN, said that he visited the house on October 10th, and that when he said he had come to examine the meter, the defendant removed a piece of wire from the meter. The defendant denied this.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

"A Fit of the Blues."

My attention has been drawn to a leaderette which was published in the ELECTRICAL REVIEW of October 19th, regarding the statement which was given to the *daily Press* in answer to inquiries made by it dealing with the position and prospects of the electrical industry.

This statement, which is not to be confused with the "Trade Survey" issued by this Department at certain intervals during the year, represented what we consider a short-term survey of the situation as far as our knowledge went. Even the most superficial perusal of "Trade Survey," No. 4, issued by ourselves in June, 1928, and this statement together is sufficient to show that there is no inconsistency. We should commend to you the practice of reading exactly such documents before making any accusations of this type.

We would also impress on you the necessity for quoting the exact words contained in any publication of this Department. It is not sufficient to quote a previous statement made by yourselves and then use it to substantiate an accusation of inconsistency.

For example, you said yourselves—"the electricity supply industry was entering upon its first great period of revival." On this single statement you have based your adverse criticism of our recent pronouncement. What was actually stated in "Trade Survey" No. 4 was something quite different. It was:—

"On the basis of this evidence *alone*, we *should* expect that *industry* is entering on a first great period of revival."

You will notice that there is no mention of the electrical industry, but of industry as a whole. You will also notice the use of the words "alone" and "should."

In this same publication we stated in the section, "A Forecast of Trade Conditions":—

"Looking at the industrial position as a whole, we should assume that, after a period of comparative *stagnation* in production, which may *last* almost to *the end of this year*, there will be a fairly steady recovery which may ultimately lead to revival of all branches of production."

These two sentences constitute in themselves sufficient reply to your criticism, which gives an entire misrepresentation of the case.

In our statement to the *daily* Press on October 10th we drew attention to the fact that the state of stagnation prophesied in our previous "Trade Survey" had actually occurred after the first quarter of this year and had caused a reduction in activity generally. Such a reduction can be found in the evidence of unemployment returns, railway freight statistics, and in the reports of the leading industries. If against that evidence you still maintain that industry is in a flourishing condition, you must belong to the tribe of super-optimists. It is our concern to state the truth and not to pander to a state of cheap criticism or political legerdemain.

With reference to the electrical industry, we can refer you again to the unemployment returns for September, where you will find that unemployment in electrical engineering is low 5.3 per cent., compared with 4.6 per cent. for the corresponding period of last year, and in electrical wiring 7.3 per cent., compared with 5.7 per cent. for last year. The only improvement that has taken place has been in cables, which is 5.4 per cent., compared with 5.8 per cent. for last year. In our statement we drew attention to the fact that the cable industry had been slightly more prosperous than in 1927.

Again, we would commend to your notice the returns of export shipments of electrical machinery and apparatus during the first nine months of this year. They show a decrease.

In conclusion, we would emphasise the fact that the statement we made was issued in answer to inquiries by the daily Press, which was sufficiently interested in the position of the electrical industry to make such inquiries. During four years, in which the writer of this letter has been in close touch with the Press regarding electrical matters, when hundreds of inquiries and special interviews have been granted to daily Press representatives, the technical Press, and by it I mean specially the ELECTRICAL REVIEW, has contented itself with criticising practically every publication we have issued to the Press, and it has made no move yet to get into direct contact with this Department.

Hugh Quigley,
Economic and Statistical Department,
BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION.

London, *October 26th*, 1928.

[Our correspondent appears to be labouring under some grievance or other, and there are remarks in his letter which could be replied to in detail, but discussion of which might neither please him nor make for general edification. We have always been very generous in devoting space to reports issued from the offices of the Section. Full reproduction is, of course, impossible and we have to content ourselves with summarised notes and comments. We have found little occasion to criticise. Our leaderette of October 19th represents the effect produced upon many minds by the latest Press statement. We still find it difficult to reconcile the "Trade Survey" of June, 1928, with that statement.

The writer is obviously unaware that the ELECTRICAL REVIEW obtained a copy of the statement issued to the "daily Press" by *direct contact* with his department. We secured it after personal application immediately after it appeared in the daily Press. On many previous occasions we have similarly obtained information by direct application to the B.E.A.M.A. offices. All communications received from the Department have been faithfully dealt with, for no question of inaccuracy has ever been raised until now. The quotation, "the electricity supply industry is entering upon its first great period of revival" was, as we have stated, from the ELECTRICAL REVIEW of June 8th. It was our own comment and, we contend, a view which might quite excusably be taken as a result of reading the complete paragraph in the June "Trade Survey" (p. 16) from which the writer of the above letter quotes in conjunction with a later statement. We give both of these extracts below:—

Page 16.—"Taken as a whole, therefore, the electricity supply industry is operating at a very high level of production indeed, much higher than at any time during the last four years, its rate of increase during 1928 being in excess of the normal in practically every part of the country, with the exception of Yorkshire and Lancashire. On the basis of this evidence alone, we should expect that industry is entering on a first great period of revival."

Page 17.—"Electricity supply is entering on a period of very great expansion indeed, and it is already clear that large programmes of generating plant and transmission system extensions must soon be undertaken."

If the last sentence of the former extract refers to industry generally, we cannot see how it can be reconciled with the statements on p. 6 that "there are very few signs of an industrial revival which will justify even remotely the abnormal speculative activity which has taken place on the Stock Exchanges," and "there is little reason, therefore, to assume that 1928 will be a boom year in any branch of industrial activity."—EDS. ELEC. REV.]

Insulating Oils.

I find the dictionaries give "to insert wrongfully" as a meaning of the word "foist." I gladly affirm that I had no desire to imply moral turpitude.

E. B. Wedmore,
Director and Secretary,
BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION

London, *October 26th*, 1928.

Having read the article and subsequent correspondence in recent issues of the ELECTRICAL REVIEW relating to insulating oils, I should be glad if you would give me an opportunity of submitting the following to your readers, as the information in the article referred to is likely to give a misleading impression as to the nature and details of the recommendations in British Standard Specification No. 148-1927.

From a perusal of the article, it is not clear, without cross-reference to the Specification itself, which tests are those given in the British Standard Specification and which are special tests advocated by your correspondent.

I beg to offer the following specific comments:—

(1) The statement that Class B oil should not be used in transformers is contrary to the recommendations given in the Specification.

(2) The Specification clearly indicates that the B.E.S.A. test for electric strength is not intended to disclose the actual electric strength of the oil, but to establish an acceptance limit.

Reference to the British Standard Specification will show that other details than those given by your contributor are essential for the purpose of testing for electric strength. For instance, he omits to lay down the time of the test, or to mention details of the method of drawing the sample or of cleaning the vessel.

Attention has already been drawn to the fact that the test-voltage required by the Specification is 30 kV, and not 22 kV as suggested by your contributor.

(3) Arising out of the above, it may be mentioned that the method of drawing the sample is considered to be of great importance, and instructions for this occupy over two pages in the British Standard Specification—in fact, this is a matter of such importance as a vital preliminary to any method of test, that international agreement has been sought and obtained by the International Electrotechnical Commission at the outset of their discussions regarding the testing of insulating oils.

(4) The sulphur test given by your contributor is evidently based on that given in the British Standard Specification, but he makes no mention of the water-bath. The wording employed suggests a much higher degree of discoloration than is conveyed by the wording of the Specification.

(5) In the test for the detection of inorganic acids, it may be mentioned that the quantities of oil and water are laid down in the Specification and are different from those recommended by your contributor. Perhaps he would let the B.E.S.A. Committee know why he recommends different proportions.

(6) In the tests for organic acid and saponification, the method quoted is that given in the British Standard Specification, but, here again, the quantities and proportions are altered. This fact is not mentioned, and no reason for the alteration is assigned.

(7) Your contributor attaches little importance to the viscosity, but it is interesting to note that viscosity has been the subject of prolonged discussion and negotiation, and the limits set in the latest Specification are lower than those formerly given.

(8) The Specification provides for the use of the Pensky-Marten apparatus for the determination of the flash point, over five pages being devoted to the necessary detail.

(9) It is misleading to say that the sludge test described by your contributor is that approved by the B.E.S.A. The figures quoted are correct as far as they go, but the instructions given are quite inadequate. Here, again, mention may be made of the very considerable importance attached to the details of the sludge test by the International Electrotechnical Commission, a comprehensive programme of international research having been arranged.

P. Good,
Electrical Section,
BRITISH ENGINEERING STANDARDS ASSOCIATION.

London, *October 22nd*, 1928.

The Training of Apprentices.

It is pleasing to note that the A.S.E.E. has issued a suggested scheme for the efficient training of apprentices in the electrical field, which scheme is deserving of every support.

It has been stated that in 10 or 12 years' time there will be a dearth of skilled labour, but (in the writer's opinion) this dearth is already apparent. It is really surprising to note the number of so-called electricians who call on contractors in search of employment, and when tried out are found to be worthless.

I am of the opinion that the cause of this unfortunate position can be blamed on many employers who do not give their apprentices sufficient scope to extend their knowledge. For instance, what possible chance has a lad of learning the electrical business if his time is made up as follows: 1st year, sweeping out the workshop and going messages; 2nd and 3rd years, screwing tube; 4th and 5th years, wiring cheap housing schemes?

Every conscientious lad deserves an opportunity and should be given every encouragement to lead to the making of a skilled electrician and a useful member of the community.

Wishing the suggested scheme every success,

Alexander Milne.

Glasgow, *October 24th*, 1928.

Electricity *versus* Gas and Coke.

Whilst no one would question Dr. Fishenden's impartiality, the comparisons made in her article in your issue of October 19th do not appear to be quite fair to electricity. I refer, in

particular, to the statement that electricity at 0.35d. is about equal to gas at 8d. per therm for water heating.

Assuming an electrical storage heater efficiency of 98 per cent., the corresponding efficiency of gas would be 73 per cent.

I have made many tests on gas-heated water apparatus, and have yet to find so high an efficiency. From recent tests on a gas boiler and a gas geyser (both modern) I found them below 30 per cent. and 50 per cent., respectively.

Again, Dr. Fishenden states that coke at 40s. costs one-sixth as much as electricity at 1d. for equal weight of water, or half as much as electricity at 0.35d. Comparisons such as these are of no value. A coke to water efficiency of about 40 per cent. is implied, but this is not the *utility efficiency based on the heat actually used or required*, which is the efficiency that matters. The average domestic boiler generates a huge proportion of heat that is never used or required.

Taking into account excess of water heated, loss of heat through scaling and long lengths of unlagged pipes, and unlagged tanks (usually used for airing clothes, but actually supplying heat greatly in excess of requirements), the average *utility* efficiency of the average domestic coke stove is much below 40 per cent.

Could and would Dr. Fishenden kindly tell us what this utility efficiency is, both of gas- and coke-heated appliances, under actual practical working conditions?

Also, will engineers, who, unfortunately, use therms, make some tests and publish the cost per therm delivered to the water used or required?

G.

October 20th, 1928.

Electromagnetic Forces.

On again consulting Wedmore & Trencham's book, I find that the case is precisely as stated by me in your issue of September 28th, and not at all as suggested by them in your issue of October 26th.

In the second paragraph on p. 236 of that book they give a rule for calculating the force between two parallel conductors carrying "direct current"; and when we apply this rule to any case in which the distance between the conductors is not less than three times their length, we get a result that is more than twelve times what it ought to be. The authors now say that the rule (or "deduction," as they prefer to call it) was intended only for cases in which the distance between the conductors is very small in comparison with their length. But the book does not give any hint as to this; and, so far as I am aware, the authors never thought of limiting the rule to these cases until I proved that it gave wrong results in other cases. However, they now know about my rule that gives correct results in all cases, and I therefore hope they intend to scrap the old rule.

Their reference to fig. 146 is beside the point; for each of the short conductors is there acted upon by three long conductors at right angles to itself, as well as by the short parallel conductor. Further, since we there have an open polygon of five sides, the authors cannot really suppose that I would treat this case as a closed polygon of four sides. Mr. Wedmore, in particular, should never have made such a suggestion; for he long ago acknowledged the receipt of a copy of my article, and he therefore knows exactly how I would deal with a case of that sort.

If the constant 9 in the authors' above-mentioned rule is changed to 4½ (as they now suggest), this will certainly be a great improvement. But the rule will still give results that are wrong by several hundreds per cent., in quite ordinary cases. If the rule is further modified so as to exclude all such cases, it becomes practically useless. The only reasonable course is to replace that rule by the simple and accurate formula given in my previous letter.

W. F. Dunton.

Manchester, *October 27th*, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

9,585. "Apparatus for the electrical transmission of sound from gramophone records." L. H. Pearson. April 7th, 1927. (298,249.)

14,846. "Safety arrangement for electrically-driven hoisting and like apparatus." Siemens-Schuckertwerke Ges. June 5th, 1926. (272,222.)

15,272. "Television and like apparatus." R. L. Aspden. June 8th, 1927. (298,255.)

17,268. "Apparatus for assembling galvanic cells." Burgess Battery Co. July 17th, 1926. (274,444.)

17,330. "Electric rectifier tubes.' Dr. A. Gehrts. June 29th, 1927. (298,120.)

17,632. "Arrangements for smoothing out ripple in a direct or rectified alternating current." British Thomson-Houston Co., Ltd. T. H. Kinman and L. J. Clark. July 2nd, 1927. (298,258.)

17,659. "Imitation fires." Automatic Telephone Manufacturing Co., Ltd. and P. N. Roseby. July 2nd, 1927. (298,112.)

17,869. "Electric switches." G. W. Melland. July 5th, 1927. (298,182.)

18,051. "Electromagnets." H. E. Rance. July 7th, 1927. (298,267.)

18,171. "Operating mechanism for electric switches." A. Reyrolle & Co., Ltd., F. Coates and M. Petry. July 8th 1927. (298,272.)

18,230. "Electric welding." J. F. Lawson. July 8th, 1927. (298,273.)

18,233. "Production of alternating currents and alternating current motors." O. F. Von Kohorn zu Kornegg (trading as O. Kohorn & Co.), A. Perl and H. Deschmann. August 5th, 1926. (275,584.)

18,458. "Wire-drawing apparatus." W. E. Beatty (Bell Telephone Laboratories, Inc.). July 11th, 1927. (298,281.)

18,703. "Galvanic batteries." L. A. Levy and Almeida Accumulators, Ltd. July 14th, 1927. (298,289.)

19,420. "Electron-discharge device." A. Mavrogenis. July 21st, 1927. (298,296.)

19,721. "Method of augmenting the output of electric cells." G. C. Furness. July 23rd, 1926. (274,907.)

20,137. "Fuse-carrying gear for overhead electric conductors." Electrical Improvements, Ltd., and R. W. Gregory. July 29th, 1927. (298,307.)

20,505. "Electric contact devices." British Thomson-Houston Co., Ltd., and F. W Leevers. August 3rd, 1927. (298,311.)

20,712. "Electrical condensers." A. Proen. August 5th, 1927. (298,312.)

20,997. "Electric cables." Siemens Bros. & Co., Ltd., and A. E. Foster. August 9th, 1927. (298,318.)

22,351. "Contacts for electrical switchgear of the truck or other like types." G. Ellison and H. C. Fox. August 25th, 1927. (298,329.)

22,625. "Electrical welding machines." J. W. Sadler, A. Longhorn and J. W. Sadler & Co., Ltd. August 29th, 1927. (298,331.)

23,185. "Electromechanical resonance device for distant control." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz and Soc. l'Action à Distance. September 3rd, 1926. (277,024.)

23,466. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. September 7th. 1926. (277,341.)

24,011. "Dynamo-electric machines." W. R. Uggla. December 7th, 1926. (282,005.)

24,129. "Electrically-operated washing-machine." Siemens-Schuckertwerke Akt. Ges. September 14th, 1926. (277,666.)

24,741. "Caps for electric incandescent lamps and similar articles." Lamp Caps, Ltd., and C. Barry. September 20th, 1927. (298,351.)

24,758. "Manufacture of cored cartridges for galvanic cells." F. Killian. September 20th, 1927. (298,352.)

27,005. "Production or assembly of electrical tumbler switches." J. A. Crabtree. October 12th, 1927. (298,370.)

27,625. "Bonding of electric cables." C. J. Beaver and W. T. Glover and Co., Ltd. October 18th, 1927. (298,373.)

28,217. "Protecting device for plug sleeves of high-tension batteries." E. Kleinmann. October 24th, 1927. (298,376.)

29,178. "Means for sending and receiving underwater sounds." Siemens and Halske Akt. Ges., F. Trendelenburg, E. Lubcke and G. Lohrmann November 1st, 1927. (298,382.)

29,984. "Electric immersion heaters." British Brass Fittings, Ltd., and A. Logan. November 9th, 1927. (298,386.)

30,070. "Engine-starting mechanism." M.C.L. and Repetition, Ltd., and J. Carr. November 9th, 1927. (298,387.)

30,303. "Illuminating units, more particularly for surgical or dental use." British Thomson-Houston Co., Ltd. November 13th, 1926. (280,578.)

33,495. "Fire-resistant alloys with high electric resistance." H. G. A. Kantzow. December 10th, 1927. (298,408.)

33,501. "Electric accumulators." P. Mallon. December 11th, 1926. (282,100.)

35,205. "Electric motor control mechanism for furnaces." British Thomson-Houston Co., Ltd. December 29th, 1926. (282,809.)

1928.

1,220. "Lamp-failure alarm devices for use on motor vehicles." E. Boetel. January 13th, 1927. (283,554.)

3,596. "Electrical contact make-and-break devices." R. Bosch Akt. Ges. February 14th, 1927. (285,372.)

5,154. "Process for the manufacture of electrical conductors in light aluminium alloys." Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges, et Camargue. March 2nd, 1927. (286,264.)

5,383. "Vacuum switch for alternating currents." Maschinenfabrik Oerlikon. February 25th, 1927. (285,909.)

5,913. "Electric arc-lamp for use in the photographic and film industries." C. Stern and M. Glogar. February 25th, 1928. (298,437.)

6,879. "Process and means for the self-excitation of synchronous alternating current machines." Siemens-Schuckertwerke Akt. Ges. March 15th, 1927. (287,108.)

8,514. "Reversing switches for electric motors." Siemens-Schuckertwerke Akt. Ges. May 18th, 1927. (290,630.)

9,346. "Switch control means for electric polishing, waxing or scrubbing apparatus." Inventia Patent-Verwertungs-Ges. April 26th, 1927. (289,396.)

10,053. "Illuminating appliances." A. J. Stephens (T. W. Rolph). April 3rd, 1928. (298,447.)

12,005. "Incandescent electric lamps and similar devices." British Thomson-Houston Co., Ltd. April 26th, 1927. (289,403.)

12,551. "Electric motors with a centrifugal coupling." Siemens-Schuckertwerke Akt. Ges. May 28th, 1927. (291,087.)

15,726. "Coil junction boxes for submarine cables." Felten & Guilleaume Carlswerk Akt. Ges. May 28th, 1927. (291,342.)

15,947. "Means for maintaining constant frequency in electric oscillation generators." C. Lorenz Akt. Ges. June 24th, 1927. (292,584.)

17,924. "Ignition systems." E. Von Lepel. June 20th, 1928. (298,458.)

21,411. "Apparatus for the electrical transmission of sound." L. H. Pearson. April 7th, 1927. (Divided application on 298,249.) (298,275.)

21,412. "Apparatus for the electrical transmission of sound from gramophone records." L. H. Pearson. April 7th, 1927. (Divided application on 298,249.) (298,276.)

21,413. "Apparatus for the electrical transmission of sound from gramophone records." L. H. Pearson. April 7th, 1927. (Divided application on 298,249.) (298,277.)

21,442. "Mercury-vapour generators." British Thomson-Houston Co., Ltd. August 4th, 1927. (295,021.)

22,389. "Straight-line-motion mechanisms." British Thomson-Houston Co. Ltd. August 4th, 1927. (295,036.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 24th :—

SS (lettering and design). No. 461,914. Class 6. Dynamos, electric motors, electric starters and parts thereof.—Siemens-Schuckertwerke Gesellschaft, Berlin. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Uniloy. No. 493,763. Class 6. Electrical machines.—Chicago Pneumatic Tool Co., New York. (British representatives: William Brookes & Son, 5, Chancery Lane, W.C.2.)

Rishar. No. 494,621. Class 8. Radio-telephone apparatus and parts thereof, etc.—J. Harris & Sons, Ltd., 64, Hanover Street, Liverpool.

M.E.M.8 (lettering and design). No. 492,064. Class 13. Electric switches (ordinary) and electric fuses.—Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham.

Wee-Apex. No. 493,393. Class 13. Switches and fuse-gear.—Foster Engineering Co., Ltd., Morden Road, Wimbledon, S.W.9.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ARBROATH.—Children's ward and other extensions at Arbroath Infirmary (£15,000); J. W. Clark, architect. Waiting rooms, &c., for Progressive Motor Services, Ltd.; the manager.

BEXHILL.—Yacht building works, Galley Hill; Major J. R. Gould. Maternity home, Alexandra Road; Nursing Association.

BIRKENHEAD.—Branch clinic (£4,300); borough engineer.

BLACKPOOL.—Destructor buildings, Bispham (deposit £2 2s.); F. Wood, borough engineer.

BOLTON.—Extensions, town hall, library, and art gallery (£611,000); Bradshaw, Gass & Hope, architects.

BO'NESS.—School for West Lothian Education Authority; the clerk to the Authority, Bathgate.

BOREHAM WOOD.—School (£5,400), for Herts. E.C.; director of education, Hertford.

BRAMPTON.—Housing scheme (40); I. Wilson, donor.

BRIERLEY HILL.—Housing scheme (120), for the U.D.C.; John Yorke, surveyor (returnable deposit of £5 5s.).

BRIGHTON.—Ward, Women's Hospital, Buckingham Road; Hospital Committee. Additions, factory, Lewes Road; Schweppes, Ltd. Town hall; Corporation Improvements Committee. Cinema, Brills Baths site; F. C. Mitchell, architect for Savoy Cinemas, Ltd. Housing scheme, 220 acres, Bristol estate; borough engineer.

BURRY PORT (Carmarthenshire).—Roman Catholic Church; Rev. Father Rowlands.

CLACTON-ON-SEA.—Reconstruction of station for the London & North-Eastern Railway Co.; engineer.

COLCHESTER.—279 houses, Harwich Road; borough engineer.

COVENTRY.—Churches at Coundon and Earlsdon (£15,000); vicar of Coventry. Cinema; Hattrell & Wortley, architects, Queen's Road; Philpott Bros., builders, 116, Much Park Street.

CROYDON.—Hall, Montpelier Avenue; F. S. Smith, Ross Parade, Wallington.

DARLINGTON.—Development of Cockerton estate for houses; Armstrong & Bussey, builders. School (300 places), for the managers of St. Cuthbert's School; Rev. Robert F. Drury, vicar.

DOVER.—Boys' secondary school for Kent E.C.; W. H. Robinson, education architect, Sessions House, Maidstone (returnable deposit of £2 2s.).

DUMBARTON.—Municipal housing scheme (£21,000); burgh surveyor.

EASTBOURNE.—Town hall extension, Grove Hall site; borough engineer. Alterations, Grand Hotel, Grand Parade; G. Bainbridge & Sons. Suggested aerodrome, Crumbles; Corporation.

FALMOUTH.—Hospital for the board of management; R. F. Wheatley, architect, Truro.

FARNHAM (Surrey).—Church, Frensham, for the Congregational trustees; Rev. F. J. Layton, pastor.

GILLINGHAM (Kent).—School, Rainham, for the borough E.C.; borough surveyor.

GLASGOW.—Forty-five six-apartment houses; John Dickie and Son, Ltd., Muir End, Glasgow, builders. Factory at Pollokshaws for H. W. Stewart, Ltd., 84, Riverford Road, Pollokshaws; the manager. Trades school (£80,000); clerk, Education Authority, Bath Street.

GLOSSOP.—Improvements, Partington Home; R. Cawkwell, architect, Sheffield. Works extensions; River Etherow Bleaching Co., Ltd.

HARPENDEN.—Practical instruction centre (£2,500), for Herts. E.C.; director of education, Hertford.

HIGH WYCOMBE.—Factory extensions, Abercrombie Avenue, for Ellis & Howland. Houses (42), for the T.C.; A. C. Dean, builder.

HUDDERSFIELD.—Housing scheme (126), Penistone Road, and 103 houses, Leeds Road, for the T.C.; borough surveyor.

INVERNESS.—Corporation housing scheme (£22,000); burgh surveyor.

KENDAL.—Silk factory for new company; Sir P. Jackson, chairman, Huddersfield.

KIDDERMINSTER.—Scouring house and laboratory, Green Street, for the Carpet Manufacturing Co., Ltd. Printing works extensions, Coventry Street, for G. T. Cheshire and Sons, Ltd.

LEEDS.—Reinstatement after fire (£10,000 damage) at storeroom and messroom of leather works; W. L. Ingle, Ltd., leather manufacturers, Churwell, near Leeds.

LICHFIELD.—Hospital (£20,000), for the Joint Building Fund Committee; secretary.

LOCHEND.—United Free Church; Rev. J. Harry Miller, Moderator, U.F. Church, Scotland.

LONDON (S.W.).—Theatre, Whitehall (£150,000); E. A. Stone, architect.

(Ilford, E.).—Sixty-three houses, Middleton Gardens and 25, Perth Road; Suburban Developments (London), Ltd.

(Stepney, E.).—154 maisonettes, Milk Yard; borough engineer.

(Greenwich, S.E.).—Forty-eight tenements, Hughes Fields Estate; R. J. Rowley, Ltd., Tottenham.

(Lambeth, S.E.).—Extensions, Archbishop Temple's Central School; governors.

(Lewisham, S.E.).—Cinema, London Road; Douglas Halse and Co., Ltd.

(Balham, S.W.).—Thirty-two houses, Upper Tooting Park; F. T. Wooding & Sons.

(Clapham, S.W.).—Alterations and additions, Albion Works, North Street; J. W. Falkner & Sons, Ltd.

(Kensington, S.W.).—375 flats, St. Quintin Estate; Sutton Dwellings Trust.

(Putney, S.W.).—Extensions, Putney Hospital, Lower Common; Simmons Bros. Factory for Leighton-Straker (Bookbinding) Co., Ltd., Merton Road; Clifford, Fee and Gale.

(Streatham, S.W.).—Thirty houses, Ellison Road; H. F. Buchan.

(Wandsworth, S.W.).—Additions, *Borough News* printing works, Putney Bridge Road; Lole & Co., Ltd.

(Holborn, W.C.).—Premises for *Daily Mirror* Newspapers, Ltd., Saffron Hill; Ellis & Clark.

LONDON COLNEY.—School (£9,216), for Herts. E.C.; county architect, Hertford.

LUTON.—Cinema, Alma Street and New Bedford Road, for F. C. Dillingham. Bank, Marsh Road; F. Day. Factory, Holly Street, for Mrs. G. F. Hearn. Houses (50), for H. C. Janes, Ltd.

MALMESBURY.—Roman Catholic Church, Cross Hayes; priest in charge.

NEWBURY.—Dance hall, King's Road; Mr. Alfred Holland.

NORTHAMPTONSHIRE.—Mental hospital; County Council.

NORTHWOOD.—Secondary school, Pinner Road; Middlesex Education Committee.

ORMSKIRK.—Training college; Director of Education, County Offices, Preston.

PENDLEBURY (Lancs.).—Houses (90), Cliveley Bank, Clifton, for the Cliveley Estate Co.

PENISTONE.—Extensions to Penistone Grammar School (£4,100); West Riding County Education Dept., County Hall, Wakefield.

PENWORTHAN.—Police station (£5,000); Lancs. Standing Joint Committee.

PLYMOUTH.—Corporation schemes: Borough hospital extension (£70,000), abattoir (£71,000), refuse destructors (£31,000), foreshore improvements (£14,500); Corporation Committees.

PRESCOT.—Extensions, Grammar School (£7,380); governors.

RADLETT (Herts.).—Congregational Church; trustees.

SALFORD.—Extension of Mount Carmel R.C. school (£11,000), for the managers.

SMETHWICK.—Works extension, Oldbury Road; Chance Bros. & Co., Ltd. Cinema, Brasshouse Lane; P. Dyche, 44, Vernon Road, Birmingham.

STOKE-ON-TRENT.—170 houses, Hanford Estate; city engineer.

THORNE (Yorks.).—Additional 100 houses for the R.D.C.; surveyor.

TORQUAY.—Fifty houses, South Parks, and 180 at Lummaston Farm; borough engineer.

TOTTINGTON.—Reconstruction of Tottington Mill and other extensions, for British Breda Silk Co., Ltd.

TUNSTALL.—Institute, Oxford Road; Miners' Welfare Committee.

URMSTON.—Extensions, Grammar School (£6,000); governors.

WELWYN (Herts.).—Housing scheme (100), for the U.D.C.; surveyor.

WESTON-SUPER-MARE.—Boys' and girls' secondary schools, for Somerset E.C.; director of education.

WHITEHAVEN.—Empire theatre; T. Nicholson, architect, Workington.